BULLETIN OF THE HISTORY OF MEDICINE

ORGAN OF THE AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE AND THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE

Editor—HENRY E. SIGERIST

VOLUME VIII NOVEMBER, 1940 NUMBER 9

REGNIER DE GRAAF
1641-1673

HUBERT R. CATCHPOLE, PH. D.
Laboratory of Physiology, Yale University School of Medicine, New Haven, Connecticut

I. LIFE AND WORKS

The approaching tercentenary of the birth of Regnier de Graaf renders the present time a favorable one to inquire into his life and writings. A more pressing justification could perhaps be sought in the relative neglect of the accomplishments of a man whose name provides such a celebrated eponym—the Graafian follicle. Only the briefest biographical sketches and few translations of de Graaf's publications have appeared in English. Although not to be ranked with the greatest masters of medical science, de Graaf is, nevertheless, a significant and attractive figure. His short career was marked by ingenious experiments on the physiology of the pancreas and by brilliant anatomical researches on the generative systems. In an experiment remarkable for this era, he investigated the mode of generation in the rabbit and is to be credited with the first description of the formation of the corpus luteum. These achievements, coupled with his invention and construction of a highly serviceable syringe, might be considered sufficient reason for assigning him an early position in the phylogeny of the endocrinologist.

SOURCES

In compiling the following record, I have been most fortunate in having had access to first editions of most of de Graaf's individual works and to his collected works in Latin from the library of Dr. John F. Fulton. I have also a very useful French translation of the collected works made by an anonymous author and published at Basel probably in 1699 (19). The revised version (3) of his *Disputatio medica de natura succi pancreatici* was issued in French by the author himself. In English there is a translation of the 1671 *Tractatus de succi pancreatici natura* (4) made by Christopher Pack in 1676 (5), which I have seen as a photostatic reproduction of the copy in the Bodleian Library; and also a brief summarized translation from *De mulierum organis* which appeared in the short-lived *British record of obstetrics and surgery* of 1848 (12). In 1878 appeared a French translation of the minor work *De clysteribus* under the title *L'instrument de Molière* (8), as a commentary on the more serious side of certain medical practices so ridiculed by Molière in *Le malade imaginaire* and other writings. It is prefaced by an excellent biographical notice of de Graaf, which it is difficult to avoid paraphrasing. The histories of Portal (1770) (36) and of Eloy (1821) (29) include notes on de Graaf and his works. Of other publications relevant to the subject may be cited a medical thesis of the University of Bordeaux by Albert Rey (37) dealing with de Graaf in relation to Sylvius de le Boë, an article (Italian) by Vedani (42), a note on the author and a translation in the collection of Fulton (31), and an appreciation in the collection of Stirling (40).

LIFE

Regnier de Graaf was born at Schoonhaven, a town between Arnheim and Rotterdam, on July 30, 1641, the son of Corneille de Graaf, a celebrated architect and inventor of hydraulic machines, and of Catherine van Brenen. By 1660 he was already studying medicine at Utrecht under Isbrand van Diemerbroeck to whom he referred later as an " excellent professor to whom I owe the progress I have made in the study of the human body " (7, p. 205). Removing to Leyden in 1663, de Graaf came at once to the most famous university of the Low Countries and under the tutelage of two noted professors, John van Horne and François de le Boë (Sylvius). To judge the nature of the intellectual atmosphere of Leyden in these years, it is sufficient merely to name de Graaf's contemporaries there: Nils Stensen (Steno), the Danish anatomist and geologist: Frederic Ruysch, the " Prince of Dutch Anatomists "; Jan Swammerdam, anatomist and entomologist.

De Graaf was at once infected by the teachings and no doubt by the enthusiasms of Sylvius, and resolved to put the doctrines of his master to the test of experiment; partly, as he relates, " to satisfy my natural curiosity " and partly " in response to the importunity of friends at Leyden." He says: " Having satisfied the prayers of my friends, and my own desires, the matter would have rested there had not my master, to whom it were ingratitude to refuse anything, asked me to give it to the public in a small Latin treatise " (3, preface). This treatise, appearing on December 17, 1664, as de Graaf's first publication, is the thesis *Disputatio medica de natura succi pancreatici* (1). It is a brief work of ninety duodecimo pages, dedicated to an imposing array of persons—the councillors and senators of Schoonhaven, his own father, and a relative, Ysbrand van Brenen. Herein is described the first production of a temporary pancreatic fistula (31, pp. 146-152). There are three plates, excellently drawn, presumably by the author, illustrating the pancreas of the dog, the set of instruments necessary for the operation (comprising wild goose quill cannulae, bottles for collecting the juice, pith plugs for the cannulae, and clamps), and finally two pictures of the actual operation. One depicts the opened animal with cannula and bottle in place; the other, the animal standing, with the collecting bottle fixed to its abdomen. There is also shown a bottle for collection of salivary juice, but it is not clear whether the parotid duct was actually cannulated. Thus, at the age of twenty-three, de Graaf had successfully performed an operation that was neglected by experimentalists for 200 years, until again taken up by Claude Bernard. The high esteem in which de Graaf held Sylvius unfortunately caused his ideas on the use, and even his observations on the nature, of the juice to be subordinated to the iatrochemical predilections of the latter. Thus it can be admitted that his speculative conclusions are largely absurd. But his theories respecting the pancreatic juice and on the genesis of intermittent fevers that followed in the French edition had an enormous vogue and confirmed the reputation of their author.

In 1665 de Graaf proceeded to Paris where his fame gained for him the favor of medical circles and the good will of the " Curious." He met Habert de Montmor, counsellor of Louis XIV and powerful

patron of science; Bourdelot, formerly physician to the Queen of Sweden, who held gatherings of the *Académie des Curieux de la Nature* every Monday at his house; Jean-Baptiste Denis, physician to the King and an early advocate of blood transfusion, and Chapelain, the somewhat insufferable heroic poet and medical dilettante. The latter seems to have got along surprisingly well with de Graaf; he assisted in the preparation of a French edition of *De succi* and earned therein an enthusiastic dedicatory address. In this edition the subject matter of the thesis is revised and extended. It appeared in 1666 under the title *Traitté de la nature et de l'usage du suc pancreatique, ou plusieurs maladies sont expliquées, principalement les fièvres intermittentes* (3). The three plates in this volume are similar to those in the thesis, but have been redrawn. Thus in the completed operation the dog is now represented as laryngectomised, a step that was described but not pictured in the earlier work. In the text of both these works, reference is made to discoveries that were new at this time. Such were the discovery of the lymphatic vessels by Bartholin and Rudbeck thirteen years before; of the inferior salivary duct by Wharton in 1656; and of the superior salivary duct by Steno in 1661; also, of the pancreatic canal itself by Wirsung, twenty-three years before. Of the latter, he writes, "The author of this beautiful discovery, having been unfortunately assassinated by his enemies, as they say, was unable to examine the use of that canal, so happily exposed" (3, p. 7 *). He mentions Harvey, of whose theory Sylvius had been an early continental partisan (3, p. 5). The pancreas is recognized as a glandular rather than "fleshy" organ. To disprove an assertion of Bartholin that the pancreas is the excretory organ of the spleen, as is the gall bladder that of the liver, he splenectomized a dog, after making suitable ligatures; then two months later a pancreatic fistula was made, and pancreatic juice successfully collected. He noticed, too, that a splenectomized bitch was capable of conceiving and bearing a litter (3, p. 5). From his experiments he determined that a half ounce and two drachms of juice could be obtained from a medium-sized dog and two ounces from a large, in the space of seven or eight hours (3, pp. 24-25). As indicative of de Graaf's philo-

* A story denied by Portal, but still persisting.

sophical temper we may quote, " Knowledge of the parts of the body is as necessary to ascertain that of their function, as is the knowledge of the function to the judging of their sickness with any certainty " (3, p. 55). Illustrative of a proper research zeal we read, " After racking the brain and putting the spirit to all sorts of torture to find a proof that would completely satisfy us, we found a method by the grace of God " (3, pp. 37-38).

On July 23, 1665, de Graaf received a doctorate of medicine from the University of Angers, and about this time travelled extensively around France. Writing to Sylvius in 1668 he said, " In my journeys in France I put all my energies to the dissection of bodies which I found there in sufficiently great quantity; I preferred most to dissect the pancreas and the genital parts since I found there constantly new things, unremarked by anatomists before me. These discoveries I showed to the Curious, who frequently urged me to publish my experiences with the latter " (6). Scattered references in de Graaf's writings and letters form the only record of this period in his life. Thus he mentions dissecting the warm body of a sailor killed by a falling mast at Angers and experienced the peculiar pleasure of sampling human pancreatic juice (3, p. 58). He left France sometime during 1666, actually before the French edition of his book was published, and returned to Schoonhaven to settle some affairs; thence he proceeded to the practice of medicine at Delft. Writing to him there from Paris, in a letter dated December 16, 1666, Fabre says, " I hear with pleasure that you are working wonders at Delft, after your custom . . . but I am sorry to see you so occupied not yet to have given to your friends the results of your work on the male genitalia . . . have care of your health which is very delicate, and conserve yourself for your friends and the world " (13, pp. 47-48). De Graaf's medical responsibilities seem to have been very flexible, for early in 1667 he was back in Paris for a stay of nearly a year. Here during the space of three or four months, the French edition of his book was " presented to Dr. Bourdelot to be publickly examined, to whose house the most curious wits of the University do frequently resort " (4, preface). During this period, it having been suggested that animals might live no less without the pancreas than without the spleen, he relates: " Before all that company we extir-

pated the spleen and also most exactly the pancreas of a certain dog; the abdomen being again closed, Dr. Bourdelot commanded his servants to keep the dog most diligently, who, notwithstanding all their diligence, in a short time died" (4, pp. 114-115).

Early in 1668 de Graaf returned to Delft, and in this year were published three treatises in a single volume: *De virorum organis generationi inservientibus, de clysteribus et de usu siphonis in anatomia* (7). A portrait of the author at the age of 25, drawn by Watelé, and engraved by Edelinck, commonly appears in this volume (Fig. 1). This work is inscribed to Habert de Montmor in a dedication dated May 12, 1668, from Delft. The first edition is also prefaced by a letter written by de Graaf to Sylvius (6) on February 20, 1668, summarizing his findings and asking the opinion of his old master, and by Sylvius' reply, dated the Ides of March. *De virorum* can be discussed more conveniently later. The other, and shorter, treatises are of some curiosity. *De clysteribus* treats of the clysters or purges that reached a summit in popular approval in the 17th century (30). Molière's hypochrondriac thus sums up the situation: "This month I have taken eight mixtures and twelve clysters, and in the previous month there were twelve mixtures and twenty drenches—it is no wonder I am not so well this month as I was last" (34). The history and composition of various purges is described and an instrument pictured whereby they might be self-administered. In a letter dated March 14, 1669, to his countryman, Plemp (14),* who occupied the chair of medicine at Louvain, de Graaf described the construction of this instrument and even mentions a manufacturer, the noted Samuel de Musschenbroeck of Leyden, who, "in his shop near the church of St. Peter, at the sign of the Oriental Lamp, was prepared to construct it with great care, according to the instructions of de Graaf." Decided ingenuity was indeed necessary to fabricate a narrow, flexible, water-tight tube, in an age when rubber was unknown, that would moreover be resistant to the atrocious mixture of chemicals that composed the clysters. De Graaf recalls that a somewhat similar device was in use in England

* This letter first appeared as a postscript to the *Defensio*, 1673. In the *Opera omnia* and in translations it is appended to *De clysteribus*, where it more appropriately belongs.

Fig. 1.

The Watelé portrait from *De virorum organis*, 1668.

for the recondite purpose of introducing tobacco smoke into the intestinal tract (7, p. 212). He describes further an instrument consisting of a length of bird's intestine, having affixed at either end the feather shaft of a bird, that could be used for the transfusion of blood from animal to animal, and was much more convenient than the inflexible metal tubes used by Denis in Paris (7, p. 210).

The short *De usu siphonis* was a collection of knowledge on the use of the injection method in anatomy. De Graaf is probably one of the first to construct and figure a syringe of an essentially modern pattern. His instrument had a barrel of copper or silver, a long bent cannula that screwed on to a leather washer, and a piston packed with thread. A hundred and seventy-five years later, such an instrument was being used almost without modification. De Graaf's experiments on injection have been so well described by F. J. Cole in *The history of anatomical injections* (38) that it is unnecessary to dwell on them further here. Reprints of this popular trilogy are said to have appeared in 1670 and 1672. A reminder that the author was also a busy practising physician at this time is given by two interesting communications made by letter to Joachim Elsner of Breslau, a member of the Leopold Academy, and which appeared in the first volume of that Society's *Miscellanea Curiosae* published in 1670. These are observations on "Ossification of the carotid artery" (22) and on "An abnormal uterus" (23), made on two patients during the spring of 1669. In 1671 de Graaf published a new treatise in Latin entitled *Tractatus anatomico-medicus de succi pancreatici, natura et usu* (4). This is considerably revised from the French *Traitté* of 1666 and is the edition that appears in the collected works, and from which all subsequent translations were made. However, the plates are the same as those in the 1666 edition, and the work is still dedicated to Chapelain. Appended to this treatise is a letter dated May 30, 1671, addressed to Schacht, professor of medicine at Leyden, entitled *De partibus genitalibus mulierum* (9), in which de Graaf writes: "You are no doubt surprised that I have not yet published my work on the female genital parts, of which I sent you the plates a year ago; blame the ordinary occupations of one of my profession. The exchange of letters with numerous savants occupy me such that I cannot hope before a year

Fig. 2.

The Pinchard portrait from the Fulton copy of *De mulierum organis*, 1672.

Fig. 3.

The engraved title-page from the Cushing copy of *De mulierum organis*, 1672.

to put the treatise in the form I desire. But lest the intermission arouse the envy of those whom I have allowed to see my figures, to profit at my expense, I have resolved to give to the public a succinct account of these same parts." There follows a summary of his principal findings. At this time de Graaf was beginning to become involved in an unfortunate disagreement with Swammerdam regarding the priority of certain of his findings. Disregarding for the moment the merits of this quarrel, following the above letter and early in 1672 appeared de Graaf's culminating work and chief merit to fame entitled: *De mulierum organis generationi inservientibus* (11) (Fig. 3), carrying as subtitle (translated): *A new treatise wherein it is demonstrated that man and all those animals that are called Vivipara, these no less than the Ovipara, derive their origin from the egg.* The dedication, dated the Ides of February, 1672, is to Cosimo III, Duke of Tuscany, a Medici prince and patron of science, who had visited Holland in 1669. This volume is adorned with the second (Pinchard) portrait of de Graaf that has survived (Fig. 2); here he is shown as of a fuller figure and greater maturity than in the Watelé drawing.

In May 1672, Swammerdam published his *Miraculum naturae, sive muliebris fabrica* (41), prefaced by a letter to the Royal Society of London whom he asks to be the judges of his accusation, made therein, that de Graaf had appropriated the discoveries of Van Horne and himself. This work contains his engraving of the virgin uterus, dedicated to the aged Tulp, the physician of Rembrandt's "The anatomy lesson." The controversy between de Graaf and Swammerdam largely ranged around a preliminary communication of Van Horne (32) addressed to Rolfinck in a letter dated March 5, 1668, describing dissections he had performed on both sexes. Later Swammerdam collaborated with him on some drawings, and on the death of Van Horne in 1670 had taken a stand against de Graaf on their joint behalf. In reply to the *Miraculum naturae*, de Graaf indited a *Partium genitalium defensio* (13) which appeared early in 1673, also addressed to the Royal Society, which takes up Swammerdam's charges in great detail. There would seem to be little merit to Swammerdam's contentions, although the issue is complicated by the fact that the investigations of de Graaf and Van Horne were

being pursued simultaneously, and since their circles undoubtedly overlapped it would be absurd to assume complete independence. But the charge of plagiarism can be effectively disposed of, for de Graaf had actively dissected the genital parts since 1665, which dissections he had freely demonstrated to many of the Curious; moreover, his findings and interpretations frequently disagreed with those of Van Horne. In respect of the female ovaries, the contribution of Van Horne is freely acknowledged in de Graaf's book. At the end of the *Defensio* he answers in polemics a defamatory libel directed against de le Boë Sylvius and himself by an anonymous writer. This might well have been the tract by Pechlin (35) published at Leyden early in 1673 under the pseudonym Janus Leonicenus.

Of the career of de Graaf little further remains to be said. He had married Marie Van Dick in 1672. This year his Catholicism apparently prevented his succession to the chair of Anatomy at Leyden, vacated by the death of Sylvius. On April 28, 1673, he transmitted to the Royal Society of London the first of the long series of letters written by his fellow townsman, Anthony van Leeuwenhoeck, recommending it highly to their interest (28, p. 40). Regnier de Graaf, "Physician and Celebrated Anatomist of the Town of Delft, in Holland," died, it is said of the plague, on August 17, 1673, in his thirty-second year.

Works

Passing to a review of his two chief works and first to *De virorum*, de Graaf expresses a now familiar theme when he says: "The human body is composed of principles so contrary among themselves that their mere composition convinces us of the necessity of death. His excrements are constantly at war and as soon as one overrides another the whole economy goes to pieces: soon illnesses come in droves, and he finds himself succumbing with insupportable pains. Man, then, cannot be immortal on this earth, but he has the consolation in dying of living again in his children, and God has given him the means of generation not only for a thousand years but even for a species of Eternity—and for this purpose there are certain

organs of the human frame fashioned with a structure so delicate that the hand of Providence may therein be witnessed" (7, p. 1).* He described the external male organs with a disquisition on eunuchoidism, cryptorchidism, and several abnormalities, and then proceeded to a minute examination of the arteries, veins, nerves, and lymphatics of the genital parts. Quoting Fallopio, Spieghel, and Vesling as believing the substance of the testes to be glandular, as well as the opinions of Wharton and Vesal, he says: "The different beliefs of these great men are sufficient to show the difficulty of fully understanding the nature of the testis, because not one among them has found the shadow of the truth. I hold that the testis is no other than a mass of very fine vessels disposed so that if one develops them without breaking, they are found to be more than twenty ells in length" (7, pp. 54-55). To reveal this, "make a tight ligature on the vas deferens of the dog or some other animal before coitus, and the testicular vessels will be observed to swell and become visible. Or more simply remove the tunica albuginea of a large dormouse and throw the testes in a basin of water, when the vessels will develop one from the other" (7, p. 56). Several vessels (the vasa efferentia) leave the testis and pass into the epididymis (7, p. 66), which is in effect "only a long vessel which by its folding forms a body attached to the back of the testis" (7, pp. 65-65). Distally from its origin, this vessel enlarges to become the vas deferens. Its total length is more than five ells in a small animal (7, p. 66). By the method of tying off the vas deferens of a dog before coitus, he shows that the semen is "engendered and formed in the testes" (7, pp. 72-73). He speaks of a controversy with his intimate friend Bils over whether the semen is derived from lymph, as Bils believed, or from the blood, and remarks, "Not having the eyes of a lynx we are unable to see the duplicated lymphatic vessels claimed by Dr. Bils" (7, p. 75). De Graaf advances the "incontestable principle" that the semen is formed from the blood, and it remained only to show

*This passage is quoted almost verbatim (and without acknowledgment) in DIONIS, *Anatomie de l'homme*, 1702 (p. 254). He characteristically adds: "Oftentimes the prospect of pleasure, as much as the desire of Eternising oneself, so inflames the imagination that one precipitately abandons oneself to that natural passion"!

how this material passes from the spermatic artery to the seminal vessels. One theory, that of Lindanus, is that the seminal vessels are a continuation of the arteries " as he claims to have seen with his own eyes " (7, p. 77); the other, that the arteries " embrace closely the seminal vessels and transmit to the cavity of the latter the most subtle part of the liquid they contain, while the rest passes to the veins. The first will appear false to any who gives himself the trouble to follow exactly the course of the spermatic artery in the substance of the testes. It branches to the right and the left and makes a number of almost invisible ramifications that hold the seminal vessels tightly together, but never enters their substance " (7, pp. 78-79). To observe them better, a coloured liquid was introduced by means of the syringe. He concluded, " If the generation of the semen is not performed the first way, it must of necessity be in the second, for the mind of man cannot conceive of a third. In a word, the spermatic arteries dispose the material of the semen in the spermatic vessels in the same way that the hepatic arteries dispose the material of the bile in the hepatic canals " (7, p. 80). At this point in his argument, conjecture necessarily enters, and he proceeds, " When the most subtle part of the blood has entered the seminal vessels, it there receives the animal spirits, all anatomists agree, although none of them know what relationships exist between the nerves and the seminal vessels, and I, no more than they. But if it be proper to theorize in these difficult matters, it is reasonable to suppose that the nerves distributed to the membranes of the testes reach to the tunicae internae of the vessels and there discharge the animal spirits " (7, pp. 80-81). The ultimate fate of the blood vessels was a perpetual puzzle to de Graaf, who was apparently ignorant of Malpighi's observations on the capillaries, made seven years before. The situation of the seminal vesicles is described, and the fact of their absence in dogs is noted (7, p. 95). The vas deferens and the seminal vesicles enter the urethra by a common duct. From his injection experiments, de Graaf was convinced that the seminal vesicles were a depositary of the semen; and in man they are, indeed, usually found to contain sperm although this is never the case in animals. It is apparently true that, in the dead subject, fluids injected from the testicular end of the vas deferens flow first into the

seminal vesicles. De Graaf was deceived by the relatively membranous nature of these bodies into thinking them to be nonglandular (7, pp. 92 and 95). The prostate glands are described as the glandular bodies of Vesalius (7, p. 102). Concerning the function of these, he disposes of the idea that their function is to perfect the semen since " it is only necessary to have wielded the knife a little and to have seen the anatomy of these parts to be convinced that this is improbable, since there is no communication between them and the seminal vesicles whereby fluid could pass (7, p. 107) ; as to the idea that the liquid of the prostate is bitter and serves as a stimulant to the semen, it is only necessary to taste the liquid in question to know that it is not " (7. p. 108). He decided that the function of the prostatic fluid was to act as a vehicle for the semen (7, p. 112). Discussing the thesis that there are three kinds of semen, from the testes, seminal vesicles, and prostate, respectively, he quotes passages from Wharton's *Treatise on glands* of 1659 in support of this theory and says: " To parry these arguments, I say, in the first place, that Wharton supposes that which is questionable; namely that castrated animals throw semen. This I deny, for they throw merely the vehicle of the semen." The further arguments are as expeditiously dismissed. He described the anatomy of the penis, and by injecting water into the corpus cavernosa by way of the arterial supply proved that the primary cause of erection was the blood supply, with the muscular and nervous effects as contributory causes (7, p. 154).

De virorum organis is furnished with nine plates, comprising twenty-five drawings of the male genital tract and showing the care and usual accuracy with which de Graaf's dissections were made. It is remarkable that he omits all mention of the median septum of the scrotum, which he can scarcely fail to have seen.

The admirable treatise *De mulierum* is a monograph wherein the opinions of ancient and modern writers are constantly drawn upon and after discussion accepted or rejected; at the same time evidence from the author's own dissections is introduced. This work is somewhat more systematized than the earlier one on the male, being organized into sixteen chapters (Fig. 4), with both a chapter and a subject index.

INDEX
CAPITUM.

Cap. I. *Propoſitio dicendorum.* Pag. 1
Cap. II. *De Pudendo Muliebri.* 7
Cap III. *De Clitoride.* 16
Cap. IV. *De Nymphis.* 29
Cap. V. *De Hymene.* 35
Cap. VI. *De Meatu Urinario.* 64
Cap. VII. *De Vagina Uteri.* 74
Cap. VIII. *De Utero.* 91
Cap. IX. *De Fluxu Menſtruo.* 124
Cap. X. *De Ligamentis Uteri.* 142
Cap. XI. *De Vaſis Præparantibus.* 156
Cap. XII. *De Teſtibus Mulierum ſive Ovariis.* 171
Cap. XIII. *De Semine Muliebri.* 194
Cap. XIV. *De Vaſis Deferentibus Mulierum ſive earum Oviductibus.* 220
Cap. XV. *De iis quæ Ovo in Utero accidunt.* 262
Cap. XVI. *Cuniculorum Generationem complectitur.* 308

R E-

Fig. 4.

The chapter index from *De mulierum organis*, 1672.

In a preface, de Graaf announced that the history he proposed was based on new principles, for he maintains that " all men and animals take their origin from an egg; not from an egg formed in the uterus by the semen, as Aristotle says, nor by a seminal virtue, following Harvey, but from an egg existing before coitus in the female testicles." The first chapter contains a list of the parts of the female genitalia, arranged in tabular form and grouped into external and internal parts. The latter are subdivided into the principal parts, vagina, uterus, fallopian tubes, and testicles, and the less principal parts, comprising the tunicae, veins, arteries, lymphatics, nerves, and ligaments. The anatomy of the external parts is well described, but de Graaf believed that the hymen was a retraction of the vaginal orifice, rather than a specific membrane, and that the blood that appeared at coitus was due to the breaking of vessels in the violent dilatation that occurred. Concerning the criteria of virginity, he concedes that it would be " not less useful than curious to know these," but decides that most of them, " like the supposed changes in voice and hair, the dimensions of the neck, and the approach of bees, are false and fabulous, and the potions and perfumes used to decide this point but old wives' tales that scarcely merit refutation " (11, pp. 61-62). The positions of the vagina and uterus are described in relation to surrounding structures. The uterus is not always precisely central, but may be displaced, more often to the right than the left (11, p. 93). It has no cornua or cells, as Galen believed; " He could never have seen, even in a dream, a female uterus, but only those of cows, sheep and the like." De Graaf distinguishes the cavity of the uterus from the cervical canal, however, and states that the latter is so narrow in the virgin as scarcely to admit a stiletto. He finds incredible the statement of Riolan that this canal is wide open during the menses. The size of the uterus varies with age, number of children, and other factors; to give at least some idea of this variation, he states that its weight in a new born infant is a drachm and a half, at puberty an ounce and a half, and at maturity somewhat larger, but rarely more than two ounces (11, p. 101). He adds: " Whether the uterus is larger at the time of menses is disputed by several authors; there are those who think that blood collects in the uterus after the last menses till it is full, but in very

many women that I have dissected I have never found any considerable differences in the size of the uterus as would be if this were true" (11, p. 105). The external membrane of the uterus takes its origin from the peritoneum; this sustains the organ in place by virtue of the ligaments that take their origin thence. The blood supply of the uterus is through the ovarian and hypogastric arteries, which anastomose among themselves and with those of the opposite side: "These can very agreeably be seen by inflating with air" (11, p. 109). The veins may be similarly traced. He concludes that the use of the uterus is to "receive the germ or principle of the fetus, to nourish it and protect it from external injuries, to give it birth in due time, and to purge the female body" (11, p. 114).

Regarding the menstrual flow, he begins that "no physician is ignorant of what it is, but all dispute as to its nature," a sentiment that still has a ring of familiarity. He promises to deal with the subject succinctly, rather than become distracted by small difficulties. And first, he maintains that the flow arises in the uterus, rather than in the vagina, pudendae, or other parts that have been postulated. There is no connection between the moon and menses, "for the former follows an immutable course, while the latter varies" (11, p. 130). Nor is menses due to a plethora of blood passing into the vessels of the uterus and distending them to the bursting point; "This is refuted by reason and by frequent dissections: for is it reasonable that blood which following the laws of nature is circulating continuously should stagnate for any space of time in the vessels of the uterus; added to which is the fact that these vessels are inadequate to hold the amount of blood released in these periodic evacuations. I have never seen such distended vessels in a woman dying shortly before the flow, nor read of any anatomist who has" (11, p. 131). All considered, "The blood purged so regularly by the uterus depends rather upon a 'fermentation' than on any plethora, and I am persuaded that this fermentation is not confined to the vessels of the uterus alone but passes in the whole mass of the blood, as witness (the other symptoms of menstruation) when the head feels bad, the feet heavy, and the stomach deranged" (11, p. 132). The uterus is held by four ligaments: two broad, attached on both sides to the body of the uterus and the vagina, and holding the

vessels, tubes, and ovaries; and two round, attached to the body of the uterus where the fallopian tubes take their origin. The four "vasa praeparantia," *i. e.*, spermatic or ovarian vessels in the female, comprising the ovarian arteries and veins on both sides, are compared with the corresponding spermatic vessels of the male. The ovarian arteries, although more contorted in the female, are nevertheless not as long as those of the male, which must extend to the scrotum. The distribution of these vessels in the sexes also differs since, whereas in the male there are two branches of which the one goes to the testis, the other to the epididymis, in the female the principal branch goes to the uterus where it anastomoses so completely with the hypogastric artery (*i. e.*, the uterine branch of that artery) that it is difficult to determine the limits of these and to define whence the ovaries actually are supplied (11, p. 158). The same obtains for the blood supply to the tubes. The branches of the vessels extend to the female testes and not only supply their external substance, but also penetrate inwardly. He refutes those who hold that the spermatic arteries and veins anastomose among themselves for, he argues, "were they so united before arriving at the testes, the blood, indifferently propelled by the heart, would not enter the parenchyma of the testes or the extremities of capillary vessels (vasorum capillarium extremitates) or other devious paths if an easier way existed" (11, pp. 160-161). De Graaf noted that all the vessels that he described were greatly enlarged in the pregnant condition.

The female testes differ greatly from those of the male. "Their internal substance is a composition of several membranes or small fibres in the interstices of which are found several bodies both natural and unnatural. Always found there are certain small bodies full of a liquid; also, nerves and vessels dividing into an infinity of ramifications. Naturally found, but only after coitus, are globular bodies formed like conglomerate glands and surrounded by a proper membrane. These are yellow in cattle, red in ewes, and grey in other animals. Some days after coitus they are of a very thin consistency and have in their centre a clear liquid surrounded by a membrane; this, disappearing with the liquid, leaves a cavity which is gradually abolished, and after some months of pregnancy these globes are solid, and after parturition gradually abolished" (11, pp. 177-178).

This would appear to be the first description of the corpus luteum, and, moreover, fairly accurate as to its successive stages. The "unnatural" bodies to be found in the ovary include hydatids and stones. De Graaf considered, "The little vesicles, or the matter contained therein, are the things for which all other parts of the testicles exist" (11, p. 179). Some have called these vesicles hydatids, but the savant Van Horne in his preliminary communication properly calls them eggs, and, following the example of that famous man, we will do so in this work, for they perfectly resemble the eggs contained in the ovaries of birds (11, p. 180). For these, when small, contain only a little clear liquid, similar to that observed in the eggs of females while on the other hand having boiled these latter, they are found to have the same colour, taste, and consistency as the white of eggs of birds. "One can assert that the females of all sorts of animals have eggs, since they are found not only in birds and in oviparous and viviparous fish, but also in quadrupeds and in women. We have found eggs in rabbits, hares, pigs, sheep, and cows; they are present on the surface of the ovary, and are so distinctly seen as to threaten a speedy exit. They vary in size; in rabbits they are as large as grains of hemp, in sheep and pigs the size of a pea, and in the cow as large as a cherry. But in these same animals are others smaller in size, down to those difficult to discern. Following coitus, the condition changes to one or more of the globular bodies described above, according to the number of fetuses in the animal. I had been led to conjecture that similar eggs occurred in other species that I had not yet dissected, and I begged the savant Stensen to appraise me of his observations in species that I lacked. He did not neglect to reply frankly, saying that he had found eggs of different sizes in deer, guinea pigs, badgers, roe deer, wolves, and asses; in mules even and in other animals" (11, p. 185).

Stensen must indeed receive credit for having, in 1667, homologized the female testes with true ovaria (38, pp. 116-118). De Graaf continues:

"The eggs are engendered and perfected in the testes, in the same way as the yellow of eggs in the ovaries of birds, by means of blood brought to the testes by the ovarian arteries; thus they are nourished, and when they have reached their natural size they become invested

TABULA VIGESIMA-SEXTA

Varias Ovorum figuras complectens.

Fig. 1. *Exhibet Ova prout tertio à coitu die in cuniculorum utero reperiuntur.*

2 *Cuniculorum Ova quarta à coitu die.*

3 *Cuniculorum Ova quinta die.*

4 *Cuniculorum Ova sexta die.*

5 *Cuniculorum Ova septima die.*

6 *Cuniculorum Ova octava die in utero cellulas efformantia.*

A. *Cellula uterina Ovum complectens.*

B. *Cellula aperta, in cujus Ovo præter liquorem nihil conspicitur.*

7 *Cuniculorum Ova nona die.*

A. *Cellula uterina.*

B. *Cellula aperta, in cujus Ovo exilis nubecula comparet.*

8 *Cuniculorum Ova decima die.*

A. *Cellula vasculis sanguineis referta.*

B. *Cellula adaperta, in cujus Ovo Embryo ut informis galba conspicitur.*

9 *Cuniculorum Ova duodecima die.*

A. *Cellula.*

B. *Cellula aperta, in cujus Ovo Embryonis delineamenta apparent.*

10 *Cuniculorum Ova decima-quarta die.*

A. *Cellula.*

B. *Embryo cum placentâ & vasis umbilicalibus.*

TA-

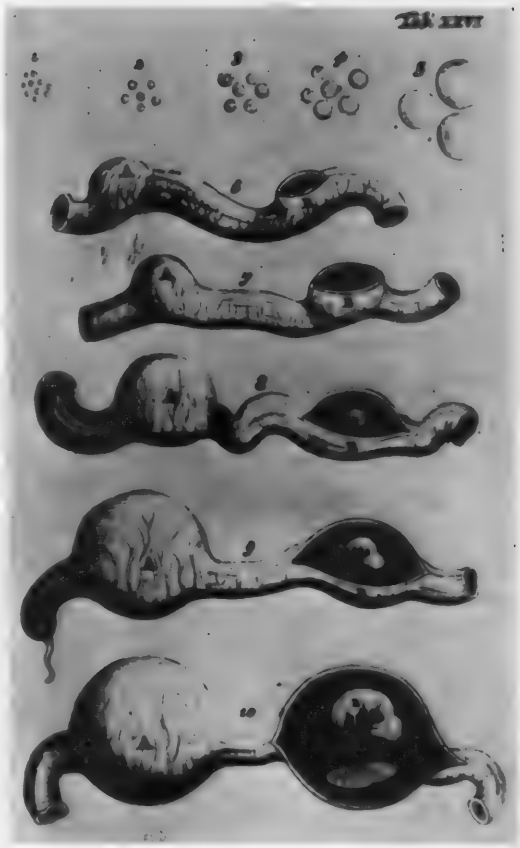


Fig. 5.

Table 26 from *De mulierum organis*, 1672: Rabbit ova at successive stages of pregnancy.

with certain tunics between which, after coitus, a glandular substance is formed, which composes the matter of the globular bodies described above. The function of the testes is, in a word, the same as that of the ovaria of birds, and on this account they could be called ovaries since they bear no conceivable relation to the testes of the male" (11, pp. 185-186).

Dealing with certain ancient and modern theories regarding the female "seed" de Graaf states, "I incline to neither side of this dispute, for I believe that women contribute nothing to generation but the eggs described in the previous chapter" (11, p. 200). He describes Harvey's experiments on generation in the fowl and concludes, "Everything considered, it is not difficult to believe that a similar sequence occurs in quadrupeds and women, who have organs destined for the same ends not greatly different from those in the bird" (11, p. 211). The final paragraph of the XIVth chapter reveals his views on the transfer of the eggs: "We must conclude that the Fallopian tubes are the true vasa deferentia of women and all female genera, or rather Oviducts that carry the Ova to the Uterus" (11, p. 255). Thus the name of Fallopio, the discoverer of these canals, became secured to them by de Graaf's demonstration of their true function. The tubes served first, in his opinion, to carry to the egg either the semen or the "seminal vapour" by which the egg is impregnated; in the second place, to receive in their extreme ends the fertilized egg that has now been expelled from the ovary, and to conduct it to the uterus. Few of these stages were, at this time, susceptible of direct proof. De Graaf conceived of the female egg as one of the ovarian vesicles. He imagined, and so pictured these vesicles, as capable of being shelled out of the ovary in their entirety (Fig. 5). This concept naturally involved him in several difficulties: why these were not found free in the region of the ovary; how bodies of this size could pass down the tubes, and why bodies that he found in the lower part of the tubes and in the uterus (of the rabbit) might be ten times smaller than the vesicles in the ovary. De Graaf never saw the true mammalian ova, not to be found till 1828 by von Baer. It has been noted that de Graaf was a patron of, and well acquainted with the work of Leeuwenhoeck, and the engraved title page of *De mulierum* (Fig. 3) shows one of

the *putti* examining a rabbit blastocyst with a magnifying instrument. But blinded by analogy with bird ova, the true egg was missed. There is no hint in de Graaf's writings of any idea of preformation (26, pp. 48, 164, 165). In the rabbit, although the egg is observed to grow for nine days, the fetus is first encountered as an unformed mass only on the tenth day. Regarding the changes that occur in the uterus, he quotes liberally from the writings of Harvey and Needham dealing with the formation and function of the various fetal membranes. His final chapter deals with "Generation in the rabbit," in which he attempts to prove certain hypotheses developed during his dissections of the genital parts of the female. The gift of a sure experimental approach already demonstrated in his work on the pancreas nowhere shows to greater advantage than in this research in which successive and accurately timed stages in pregnancy are patiently observed. It is convenient to deal with his techniques and findings in the rabbit in a separate note and to pass on to his application of them to the human. These, for reasons largely beyond his control, were mainly unfortunate. He concluded that four incontestable truths had been established:

"First, that those err who claim that virgins as well as women have equally the eggs described above; for the glandular substance that helps them to leave the testes only develops in the vesicles of the eggs after a fertile coitus. Second, that the eggs cannot in the space of two or three days reach the size of a cherry since those of the rabbit moistened with the semen of the male remain three days and those of females that bear longer remain some weeks in the testes, gradually diminishing in size until they are 10 times as small; then, expelled from their thick membranes, are received into the tubes and conducted to the uterus where they grow in the manner related. Third, that there is no such thing as a human fetus three or four days following coitus because the eggs of the rabbit, which only bears its young for 31 days, do not reach the uterus till the third day and one cannot see the little fetus (nubecula) till the ninth day; this must appear much later in the woman who bears longer and whose ova stay limpid for a month. The fourth is that the vulgar opinion that the woman must retain the semen of the male to become pregnant is false, since the rabbit dissected on the twenty-ninth day had

rejected all the semen of the male after coitus, yet had eleven fetuses in its uterus" (11, pp. 327-329).

It is unnecessary to comment more than briefly on the latter part of de Graaf's essay. He went wrong chiefly through ignorance of the true size and nature of the ovum, and also of the nature of the semen, soon to be elucidated by Leeuwenhoeck; he regarded the action of the semen as necessary, but ephemeral.

In presenting his work to the public, de Graaf concludes: "Here is our Treatise on the Organs of Women that serve for Reproduction, by the Grace of God achieved with exactitude, presented, not to serve for libidinage, but for the advancement of Truth and Medicine, and to show the wonder of providence and the wisdom of the Almighty, in discovering the miraculous means provided for the propagation and conservation of the human race" (11, p. 329).

This excellent work is illustrated by twenty-seven plates comprising about sixty drawings, both gross and detailed, of the female genital parts.

II. CAP. XVI. CUNICULORUM GENERATIONEM COMPLECTENS

De Graaf's experiments on generation in the rabbit form the final chapter of his *De mulierum organis*. This study is justified by the author in an opening paragraph:

> Since the foregoing facts lack ocular demonstration in women, we have had recourse to animals, which breed at a time that can be exactly noted, and which bear many young at one time, so that what escapes in one may be found in another. To this end the rabbit seemed most suitable.* First was dissected a virgin female:
>
> I found that the ovaries, although small, contained a large number of eggs, very limpid and clear, which, when opened, gave forth a glairy liquid, like the white of an egg. I opened another one-half hour after coitus; the uterine cornua were redder, the eggs practically unchanged. There was no sign of the male semen in either vagina or uterus. Six hours after coitus the envelopes of the ova † were red, and on piercing with a needle a glairy liquid issued, then a little blood from the vessels pervading the envelope. There was no vestige of semen.

---

* The rabbit was not only suitable, but a most lucky choice since it regularly ovulates 10 hours after coitus, and is the only common domestic animal (excepting the cat and ferret) that does so.

† *Ovorum folliculi*, translated: envelope or covering of the eggs.

Twenty-four hours after coitus I dissected another and found in one ovary three, and in the other ovary five, egg envelopes considerably altered. For they were now opaque and reddish, and at their surface a little pimple was manifest. On opening I saw a very little limpid liquid at their centres, and at their peripheries, a substance reddish and denser.

At twenty-seven hours I found the (? vessels of the) uterus and tubes filled with blood and the funnel-like extremities of the latter embracing the testes. As in the foregoing instance, the surface of each follicle * bore a pimple, whence, on pressing the testicle, a limpid liquid was expressed, which subsequently became denser and redder. There were no ova visible on dissecting the uterus, but its inner tunica was furrowed and a little swollen.

At forty-eight hours I examined another; there were seven and three follicles much changed in the two ovaries respectively. The pimple-like excrescences were more apparent, and on squeezing a little albuminous liquid appeared, but the red matter was thicker and came out with difficulty.

At fifty-two hours I found respectively one and four changed follicles (*immutatos folliculos*); on dissecting these I encountered a glandular material in the centre of which was a cavity devoid of noticeable liquid. I suspected that the limpid liquid inclosed in its proper membrane was burst asunder or expelled. Wherefore I searched in the uterus and tubes without success; the internal tunica of the cornua was nevertheless very inflated and glistening.

Seventy-two or seventy-three hours after coitus I examined another rabbit and found a further change in that the tubes very closely invested the ovaries; which being retracted I found in the right ovary three follicles, larger and more solid, showing in the middle of their surface a small tubercle like a pimple, pierced with a small hole. On dissection I found their median cavity empty; those tubes by which the ova must pass, I examined diligently and found in the middle of the right tube one, and in the extremity of the same cornua two, very minute ova (*duo minutissima ova*) shown in the first figure of Table 26 (Fig. 5), which though so minute are provided with two membranes, and from which, on piercing with a needle, a limpid liquid escaped, which, though it seemed surprising, is easily demonstrated. In the other ovary were four follicles, three somewhat clear, pierced with a little channel and containing a little clear liquid; the fourth not so transparent and containing no liquid, which persuaded me that the ovum had escaped; I searched in the oviduct and horn of the side and found a single ovum in the horn similar to those described above. Hence it follows that ova proceeding from the testes are ten times smaller than those yet cleaving to the testes; because, while still there, they are surrounded by other matter, the same indeed from which the glandular substance of the follicle arises.

Four days after coitus, I found four and three empty vesicles (*globulos*

* The word 'egg' has been dropped leaving *folliculus*, a small bag or sac, which is here conveniently translated as *follicle* (actually, it is now a ruptured follicle).

folliculos exinantos),* respectively, and ova in each cornua larger than the preceding as in Figure 2 of Table 26 (Fig. 5). These eggs had reached the middle of the horn. I saw more clearly than above, a second egg floating in their interior. I saw in the testes, besides follicles as described above, others that the seminal spirit had not touched, and also four black vesicles filled with a mass of blood. But I have seen these also in other rabbits and do not think them worthy of reflection.

Summarizing de Graaf's findings to this point, it is clear he considered that perhaps only a part of the substance of the " eggs " seen in the ovary actually descended to the uterus, although he had previously defended the thesis that the whole " egg " was capable of negotiating the lumen of the tube. He established the correspondence between the number of follicles discharged from the ovary and the number of eggs that appeared in the uterus, although his criterion of when the egg actually left the ovary was incorrect. In the rabbit, this occurs regularly ten hours after coitus, so that the picture he saw at twenty-four hours would have been that of recent ovulation, and indeed his description corresponds exactly with this. He established that the discharged follicle progressively fills up with a glandular material, and that after coitus unaffected follicles may still be found in the ovary. As to the eggs actually found in the uterus, these evidently represented successive stages in the formation of the blastodermic vesicle. It is difficult to decide the status of de Graaf's very earliest ova. It is now known that rabbit ova reach the uterus at 72 hours, and that at this time the diameter of the vesicle is about 0.12 mm. It increases rapidly in size, reaching 0.3 mm. at 96 hours, 1.5 mm. at 120 hours, and 3.0-3.5 mm. at 144 hours. De Graaf pictures the ova at 72 hours as small circles varying from about 0.25 to 0.5 mm. in diameter; at 96 hours they are shown with a diameter of around 1.0 mm.; at 120 hours, as 2.0 mm. or slightly less, and at 144 hours, as 2-3 mm. It is clear that sheer difficulty in draughtsmanship would prevent the exact representation of the smallest vesicles that can be seen by the unaided eye.

Five days after coitus, I observed six empty follicles in the ovaries of another rabbit and the same number of ova in different parts of the uterus

*'Empty'; *i. e.*, follicles transforming into corpora lutea in which central cavity is becoming obliterated.

without being attached. The internal membrane of these was more apparent than before. The globular bodies were large and their canals admitted the passage of a medium sized bristle.

Six days after coitus, I counted six empty follicles in one ovary, but found only five ova in the horn of that side. And the other ovary had four empty follicles but only one ovum was recovered. The reason is that they have either been thrown out of the uterus, destroyed in the follicles, or lost by some accident.

Seven days after coitus, I found in the ovaries several empty follicles, larger, redder, and harder than the preceding, and, besides, tumors or transparent cellules in different parts of the uterus. Inside these were ova larger than before, as in Figure 5 of the table. In these, besides a very apparent internal membrane and a most limpid humor, I saw nothing else. It is remarkable that the ova could imbibe so much liquor in so short a time and, from being readily removable, now become difficult to detach from the uterus.

On the eighth day after coitus, I examined two rabbits. Having opened the uteri and remarked the ova, I had to bring all my attention and diligence to their removal, since they broke at the least touch; but after boiling the uterus and ova together, the liquor hardened like the white of an egg.

On the ninth day, I dissected an old rabbit with ovaries twice the size of a young one. I found two empty follicles in the right and five in the left ovaries and also others, paler in color and flattened, which were apparently voided in previous coitus and had not yet become obliterated and reduced to small points; to these was due the increase in the size of the ovary. These bodies of the last coitus were still furnished with protuberances. There were two cellules in the right horn and five in the left; their substance was more transparent than that of the uterus proper and traversed by many arteries and veins. On opening these cellules, the ova could be clearly seen though not removed. They were filled with a crystal clear liquid in which floated an extremely delicate cloudy spot (nubecula). In other rabbits killed on the ninth day this evaded recognition. But on the tenth day in a rabbit having seven uterine vesicles, each showed on opening an unformed, mucilaginous embryo (*rude mucilagineum embryonis*) resembling a small vermiculus. The placenta was clearly evident to which the ovum was attached by means of the chorion (sic). After boiling, the consistency of the eggs was the same as described before. After twelve days, the embryo was so apparent as to render visible certain features, such as two red and two white points in the pectoral region; but the smallness of this little animal did not permit further description.

To summarize, the observations of the rapid growth of the blastocyst and its implantation on the seventh or eighth day are acute, as is also the recognition of the first visible trace of the embryo at the ninth day.

Fourteen days after coitus, the uterine cellules were larger with more and greatly inflated vessels. I recognized also that as the cellules increased in size, they approximated closer to each other. The amniotic and chorionic membranes were attached together, and having broken them, the embryo appeared distinctly as depicted in Figure 10, having a large and transparent head with the brain reaching to the tip, prominent eyes, open mouth, and ears becoming apparent. The spine curved towards the sternum as a white line resembling the prow of a ship. Very delicate blood vessels reaching along the sides of the spine sent ramifications to the back and to the extremities. In the pectoral region, two red spots larger than in the preceding stage formed the rudiments of the ventricles of the heart, to both sides of which two white spots showed the position of the lungs. On opening the abdomen, first was seen the reddish colored liver, then a whitish body to which was attached a mucilaginous mass in the form of a contorted thread representing the rudiments (primordia) of the stomach and intestines. All of which must in time increase and develop to perfection. And not to discourage the reader, I pass over the other dissections which I made day by day, except for that made the day before birth wherein those things that were previously seen indistinctly, now were clearly apparent.

The rabbit which I dissected on the 29th day (*i. e.*, a day or so before parturition) had delivered six weeks previously and, during the last coitus in which it had become pregnant, had rejected a large part of the male semen in the form of a white jelly. It had in its ovaries eleven empty follicles and other smaller ones. We have already seen that the envelopes of the eggs do not disappear completely in the ovaries, but leave certain points there * which accumulate in multiparas, whose ovaries are large and white. The uterus was no longer divided into cellules, but resembled a stuffed sausage. It had a peristalsis so strong that the fetuses nearest the vagina were forced out enveloped in their membranes and all would have been so expelled had we not extirpated the uterus entirely. The uterus was scarcely thicker than in the nonpregnant animal, differing from the human female. Inside were eleven kicking fetuses, each enclosed in its chorion, but so compressed together that there would seem to be but one chorion enclosing all. The chorion of each fetus received its blood from the umbilico-mesenteric artery and directly overlaid the amnion. To follow the figure of these membranes, I distended the kidney-shaped amnion with air; it contained no enclosed fluid; then I blew into the allantoic cavity by a tube introduced into certain passages in the white part of placenta and found that it consisted of several cellules of which the capacity was scarcely less than that of the fetal membrane. It contained about half a drachm of urine. To determine whence this had arisen, I injected first water, and then air, into the bladder by way of the ureter. But neither the one nor the other penetrated into this membrane.

---

* *Corpora albicans.*

Although there is only one placenta, it has two parts, a red and a white which are both extruded with the fetus. The white portion, placed between the red part and the uterus, is pierced with six or seven channels, and when one blows therein the red part is inflated like a sponge. The placenta has two kinds of vessels receiving two arteries from the aortic trunk and one vein from the hepatic; these subdivide and ramify.

The red and white portions of the placenta that are described may be identified with, respectively, the lobulated ectoplacenta and the deeper, submucous part of the placenta. The latter becomes progressively reduced in size during gestation and is shed with the rest of the fetal membranes. The small foramina therein described probably represent lacunae carrying uterine blood to the placenta and fetus. The essay on generation in the rabbit ends abruptly with the enunciation of four conclusions applying the findings to human reproduction; with these we have already dealt.

De Graaf in performing this research evidently must have had access to a respectable group of rabbits: some eighteen autopsies are described and it is implied that at least an equal number were examined to complete the gestation series. However, elsewhere (13, p. 66) he reveals that he had examined more than a hundred rabbits, and, in addition, had kept (and fed) more than forty goats, cows, dogs, cats, and a number of other animals, in order to learn distinctly what occurred after coitus and during gestation.

De Graaf's fine sense of experimental technique that was apparent when he devised the operation for collection of pancreatic juice shows, in a slightly different direction, in this research also. Here is the ability to plan an experiment on an adequate series of animals to make logical deductions possible from stage to stage; in a field, moreover, where active inquiry is still proceeding, and in which time relations, so accurately used by the author, are still of paramount interest.

* * * * * *

I wish to express here my gratitude to Dr. John F. Fulton, not only for the use of his de Graaf first editions, but for his help and suggestions and the many historical reference books in his library. To the librarians of the various libraries mentioned in the Bibliographical appendix, I wish also to extend my thanks for their generous cooperation and interest; I have also been fortunate in having had the items from the library of the late Dr. Harvey Cushing made available to me.

III. BIBLIOGRAPHICAL APPENDIX

A list of de Graaf's works has been compiled from various sources. No elaborate descriptions of the separate items has been attempted, but short explanatory notes have been added when necessary. The following symbols for American libraries have been employed:

DSG	Army Medical Library, Washington, D. C.
MdBJ-W	Welch Medical Library, Baltimore, Maryland
PPCP	College of Physicians, Philadelphia, Pennsylvania
ICJ	John Crerar Library, Chicago, Illinois
MBM	Boston Medical Library, Boston, Massachusetts
NNNAM	New York Academy of Medicine, New York, New York

and for foreign libraries the following abbreviations:

Bibl. Nat.	Bibliothèque Nationale, Paris
Bibl. med. neerl.	Bibliotheek der nederl. Matschappij der Geneeskunst, Amsterdam
Bodleian	Bodleian Library, Oxford
Brit. Mus.	British Museum, London
Hunt.	Hunterian Library, Edinburgh
Libr. Phys. Surg.	Library of the Faculty of Physicians and Surgeons, Glasgow
Osler	Osler Library, McGill University, Montreal

A few private libraries are also included in the listings as follows:

Cushing	The library of the late Dr. Harvey Cushing, New Haven
Fulton	The library of Dr. J. F. Fulton, New Haven
Reynolds	The library of Dr. Lawrence Reynolds, Detroit
van Wagenen	The library of Dr. G. van Wagenen, New York
Waller	The library of Dr. Erik Waller, Lidköping, Sweden

I. DISPUTATIO MEDICA DE NATURA SUCCI PANCREATICI

1. Disputatio medica de natura et usu succi pancreatici, quam summo numine sub praesidio Clarissimi, Doctissimique viri D. Francisci de le Boe, Sylvii, Medicinae practicae in Inclyta Lugd. Batavâ Academiâ professoris, publicè ventilandam proponie Regnerus De Graef, Schoonhov. Bat. Ad diem 17. Decemb. loco, horisque solitis. *Leyden, Hack,* 1664. 18° : 90 pp., 3 pl.

Note: The DSG copy lacks the half-title page that appears in No. 2. It is bound with Deleboe Sylvius, *Disputationum medicarum,* 1663, and Lower, *Th. Willisii: De febribus vindicatio adversus Edmundum de Meara,* 1666. Although listed in the *Index catalogue* as 18°, the collation (A-C^{12}, D^{6}) suggests that it is probably 12°. (See Fig. 6a).

Copies: DSG, MdBJ-W (photostat of DSG copy).

2. Regneri de Graef, Schoonhovia-Bat. De Succi pancreatici natura et usu exercitatio anatomico-medica. *Leyden, Hack,* 12°, 1664. (4) 90 pp., 3 folding pl.

Half-title: Regneri de Graef, De succi pancreatici natura et usu exercitatio anatomico-medica, in Inclyta Lugdunensi Academia, sub praesidio Viri Clariss.

DISPUTATIO MEDICA
DE
Natura & Usu
Succi Pancreatici,
QUAM
Summo auxiliante Numine
SUB PRÆSIDIO
Clarißimi, Doctißimique Viri
D. FRANCISCI DE LE BOE.
SYLVII,
Medicinæ Practicæ in Inclyta Lugd.
Batavâ Academiâ Professoris,
Publicæ ventilandam proponit
REGNERUS DE GRAEF,
Schoonhov. Bat.
Ad diem 17. Decemb. hor. horasque solitas.

LUGD. BATAV.
Ex Officinâ HACKIANA, 1664.

(a)

Title-page of Army Medical Library copy of *Disputatio medica de natura succi pancreatico*, 1664. (No. 1)

REGNERI DE GRAEF,
SCHOONHOVIA-BAT.
DE
Succi Pancreatici
NATURA ET USU
EXERCITATIO
ANATOMICO-
MEDICA.

LUGD. BATAV.
Ex Officina HACKIANA,
A° clɔ lɔ c lxiv.

(b)

Title-page of Fulton copy of *De succi pancreatici natura*, 1664. (No. 2)

REGNERI DE GRAEF,
DE
SUCCI PANCREATICI
NATURA ET USU
EXERCITATIO
ANATOMICO-MEDICA,
IN
Inclyta Lugdunensi Academia,
SUB PRÆSIDIO
Viri Clariss. & Experientiss.
FRANCISCI DE LE BOE SYLVII,
Medicinæ Practicæ Profess.
Celeberr.
Præceptoris honorandi
Publico eruditorum examini Anno 1664.
17. Decembris,
Proposita.

(c)

Half-title page of Fulton copy of the same. (No. 2)

Fig. 6.

et experientiss. Francisci De Le Boe Sylvii, Medicinae Practicae Profess. Celeberr. Praeceptoris honorandi Publico eruditorum examini Anno 1664. 17. Decembris, Proposita.

Note: A new title-page has been provided and a half-title added bearing on the *verso* an ode to de Graef. Text and plates are identical with No. 1. The titles and half-title of No. 1 and 2 have been given in their entirety for the sake of clarity in differentiating between them. (See Fig. 6b and c).

Copies: Fulton, Reynolds (Willughby copy, with ms. notes).

II. TRAITTÉ DE LA NATURE DU SUC PANCREATIQUE

3. Traitté de la nature et de l'usage du suc pancreatique, ou plusieurs maladies sont expliquées, principalement les fièvres intermittentes. *Paris, Olivier de Varennes*, 1666. 12°: (20) (2) 156 (6) pp., 3 folding pl.

Note: This is not a French translation of the 1664 Latin dissertation. Both text and figures have been revised and the section on intermittent fevers has been added.

Copies: Fulton; DSG; Bibl. neerl. med.; Bibl. Nat.; Reynolds; Waller.

Translations: Latin

4. Tractatus anatomico-medicus de succi pancreatici natura et usu. *Leyden, Hack*, 1671. 8°: (20), 216, (14) pp., 3 pl.

Note: This was reviewed in *Philos. Trans.*, 1671, *6*: 3066-3067. It is somewhat revised from the French edition of 1666, but has the same plates. The discourse on intermittent fever is now not a separate section, but constitutes Chapter XI (pp. 164-208). It was reprinted in Leclerc and Manget, *Bibliotheca anatomica*, 1699, vol. *1*, pp. 204-261. Eloy mentions an edition of 1674, which has not, however, been located.

Copies: DSU (Bound with *De virorum organis*); Fulton (lacking frontispiece); PPCP (Bound with *De virorum organis*); Bibl. Nat.; Bibl. med. neerl.; Hunt.; Brit. Mus. (957.m.3); MdBJ-W (2); ICJ; Waller (2); van Wagenen (lacking frontispiece); Cushing (2, one bound with *De virorum organis*).

English

5. De succo pancreatico: or, a physical and anatomical treatise of the nature and office of the pancreatick juice; shewing its generation in the body, what diseases arise by its vitiation; from whence in particular, by plain and familiar examples, is accurately demonstrated the causes and cures of agues, or intermitting feavers, hitherto so difficult and uncertain: with sundry other things worthy of note. Translated by Christopher Pack. *London, N. Brook*, 1676. 8°: (24) 151 [1], 16 pp.

Note: An English translation of the 1671 Latin edition. Pack was a chemist, and styled himself professor of chemical medicine. He practiced (as a quack) in

London under the patronage of Boyle and others and wrote and translated works to promote the sale of his specific.

Copies: DSG; PPCP; Bibl. med. neerl.; Hunt.; MBM; Fulton (photostat of Bodleian copy).

III. EPISTOLA AD SYLVIUM

6. Epistola de nonnullis circa partes genitales novis inventis. Ad Franciscum de le Boe Sylvium. *Leyden*, 1668.

Note: This is mentioned by Eloy; cited, but not fully reviewed in *Philos. Trans.*, 1668, *4*: 663. It has been reprinted in Leclerc and Manget, *Bibliotheca anatomica*, 1699, vol. *1*, pp. 552-553 (also in the 1685 edition). It is found on the preliminary pages of *De virorum organis* (No. 7).

IV. DE VIRORUM ORGANIS, DE CLYSTERIBUS ET DE USU SIPHONIS

7. De virorum organis generationi inservientibus, de clysteribus et de usu siphonis in anatomia. *Leyden* and *Rotterdam, Hack*, 1668. 8°: (32) 234 (14) pp., 11 pl.

Note: Two distinct variants of this work have been identified; an original edition and an apparently later reprint bearing the same title-page and date. This reprint may have been made in 1671 or 1672 to coincide with the publication of *Tractatus de succo pancreatico* or *De mulierum organis* with one or both of which it is frequently bound. The text was reset, but followed the original quite closely and carried the same pagination.

(a) The original has, on the first page of text, a narrow scroll with an animal motif and the general heading "Virorum organis generationi inservientibus" in large italic type (Fig. 7a). This same type is used on p. 217 for the heading "Usu siphonis in anatomia."

(b) The reprint has, on the first page of text, a wide scroll without the animal motif, and both the headings mentioned in (a) are in a smaller sized italic type. The first three lines of text in *De virorum organis* divide differently than in the original (Fig. 7b). A further difference is a general tendency to shorten the catchwords: thus, "extra" to "ex" (p. 5); "Testes" to "Te-" (p. 13); "Tunicae" to "Tu-" (p. 19), and so throughout.

The collections PPCP, MdBJ-W and Cushing have copies of both variants. Reprinted in Leclerc and Manget, *Bibliotheca anatomica*, 1699, vol. *1*, pp. 555-582. *Other copies:* Fulton; DSG; Brit. Mus. (7641.a.20); Bibl. med. neerl. (p. 58); Hunt. (p. 158); NNNAM (variant (b)).

Translation: French (partial)

8. L'instrument de Molière. Traduction du traité de clysteribus. *Paris, Damascène Morgans et Charles Fatout*, 1878. 8°: (2), 125 [2] pp.

Note: This translation contains on pp. 9-40 a biographical note on de Graaf and the portrait engraved by Edelink has been faithfully reproduced by Durand of Paris.

Copies: Fulton; DSG; Osler (2792); Bibl. med. neerl.; Brit. Mus. (7620.ss.6); MdBJ-W, MBM, etc.

REGNERI DE GRAAF,

MEDICI DELPHENSIS,

TRACTATUS

DE

Virorum Organis Generationi inſervientibus.

QUicumque humani corporis primordia animo attentiori perpendet, hominem neceſſario morti obnoxium eſſe luce meridiana clarius conſpiciet: nam præterquam quod ex tam variis atque repugnantibus principiis extructum ſit corpus, ejus etiam excrementa continuâ pugnâ inter ſe effervescunt: quorum unum, vitio in rebus naturalibus commiſſo, prædominium capiens, aliud ſuperat, ac hominem graviſſimis atque incurabilibus damnis

A

(a)

First page of text of first edition of *De virorum organis* (No. 7a)

REGNERI DE GRAAF,

MEDICI DELPHENSIS,

TRACTATUS

DE

Virorum Organis Generationi inſervientibus.

QUicumque humani corporis primordia animo attentiori perpendet, hominem neceſſario morti obnoxium eſſe luce meridiana clarius conſpiciet: nam præterquam quod ex tam variis atque repugnantibus principiis extructum ſit corpus, ejus etiam excrementa continuâ pugnâ inter ſe effervescunt: quorum unum, vitio in rebus naturalibus commiſſo, prædominium capiens, aliud ſuperat, ac hominem graviſſimis atque incurabilibus damnis

A

(b)

First page of text of reprint (1670 or 1672) of *De virorum organis* (No. 7b)

Fig. 7.

V. EPISTOLA AD SCHACHT

9. Epistola ad . . . Lucam Schacht de partibus genitalibus mulierum. pp. 209-216 in: *Tractatus de natura succi pancreatici, Leyden,* 1671. (No. 4).

VI. DE MULIERUM ORGANIS

10. De mulierum organis generationi inservientibus. 12°. front. *Leyden,* 1672.

Note: The only record that has been located of this edition whose title apparently lacks the designation "tractatus novus" that appears in No. 11.

Copy: Bibl. med. neerl. (see p. 93).

11. De mulierum organis generationi inservientibus tractatus novus: demonstrans tam homines et animalia caetera omnia, quae vivipara dicuntur, haud minus quam ovipara ab ovo originem ducere. *Leyden, Hack,* 1672. 8°: (24), 334, (14) pp., engr. port., 27 pl.

Note: This was reviewed in *Philos. Trans.,* 1672, *7*: 4052-4054, and reprinted in Leclerc and Manget, *Bibliotheca anatomica,* 1699, vol. *1*, pp. 538-637. DSG lists their two copies as 12°, but the collation would seem to make the 8° designation more likely. There has been no opportunity to have a comparison made of this and No. 10.

Copies: Fulton; DSG; PPCP; Bibl. med. neerl.; Brit. Mus. (7641.2.21); Hunt.; MdBJ-W (4); ICJ; Waller; MBM; van Wagenen (lacking port., pp. 331-334, pl. 25, 26, 27); Cushing (3, one bound with *De virorum organis*).

Translation: English (partial)

12. On the female testes, or ovaria. Translated from the original edition of 1688 [*sic*], by R. Knox for the British record of obstetric medicine and surgery. *Manchester, Irwin,* 1848. 8°: 8 pp.

Copies: NNNAM; Fulton (photostat of NNNAM copy); Libr. Phys. Surg.; DSG.

VII. PARTIUM GENITALIUM DEFENSIO

13. Partium genitalium defensio. Societati Regiae Londini ad Scientiam naturalem promovendam institutae, dicata. *Leyden, Hack,* 1673, 8°: (8), 83 pp.

Note: Reprinted in Leclerc and Manget, *Bibliotheca anatomica,* 1699, v. *1*, 662-673.

Copies: PPCP; DSG; Bibl. med. neerl.; Hunt.; Bibl. Nat.; MdBJ-W (4); Waller, Cushing (2, one bound with *Tractatus de succo pancreatico* and one with *De virorum organis*).

VIII. EPISTOLA AD PLEMPIUM

14. [Epistola] Vopisco Fortunato Plempio . . . pp. 76-83 in: *Partium genitalium defensio* (No. 13).

Translation: French

15. Lettre à Plempius . . . pp. 115-125 in: *L'instrument de Molière* (No. 8).

IX. OPERA OMNIA

16. Opera omnia. *Leyden, Hack*, 1677. 8°: (32), 717 [3] pp., 41 pl.

Contents: De virorum organis (pp. 1-140, 9 pl.); Epistola ad Schacht de partibus genitalibus mulierum (pp. 141-146); De mulierum organis (pp. 147-427, 27 pl.); Partium genitalium defensio (pp. 429-489); Tractatus anatomico-medicus de succi pancreatici natura et usu (pp. 491-666, 3 pl.); Tractatus de clysteribus (pp. 667-702, 1 pl.); Tractatulus de usu siphonis in anatomia (pp. 703-719, 1 pl.).

Copies: Fulton; DSG; PPCP; Bibl. med. neerl.; Brit. Mus. (1174.3.4); Bodleian; MdBJ-W; MBM.

17. Opera omnia. *Lyon, J. A. Huguetan et Soc.*, 1678. 8°: xxiv, 390 pp., 41 pl.

Contents: Tractatus de virorum organis (pp. [i-xxiv], 1-70, 9 pl.); Epistola ad Schacht (pp. [71] misnumbered 67-83); De mulierum organis (pp. 84-234, 27 pl.); Partium genitalium defensio (pp. 235-261 [266]); Tractatus anatomico de succi pancreatici natura et usu (pp. 267-358, 3 pl.); Tractatus de clysteribus (pp. 359-374, 1 pl.); Tractatulus de usu syphonis in anatomia (pp. 375-389, 1 pl.); [pp. 264, 265 are misnumbered '260,' '261.'].

Copies: DSG; PPCP; Bibl. med. neerl.; Bibl. Nat.; MdBJ-W (3); Waller; MBM; van Wagenen (2).

18. Opera omnia. Novae huic editioni praefixa est brevis narratio de auctoris vita. *Amsterdam, Wetstens*, 1705. 8°: (26), 537 [1] pp., 41 pl.

Contents: Tractatus de virorum organis (pp. 1-107, 9 pl.); Epistola ad Schacht (pp. 108-112); De mulierum organis (pp. 113-326, 27 pl.); Partium genitalium defensio (pp. 327-372); Tractatus anatomico-medicus de succi pancreatici natura et usu (pp. 373-500, 3 pl.); Tractatus de clysteribus *accedit* Tractatulus de usu siphonis in anatomia (pp. 501-537).

Copies: Fulton; DSG; PPCP; Brit. Mus. (7641.aa.2); Bibl. Nat.; Bibl. med. neerl.; Hunt.; MdBJ-W; ICJ.

Translations: French

19. Histoire anatomique des parties genitales de l'homme et de la femme qui servent a la generation avec un traité du suc pancreatique, des clisteres et de l'usage du syphon composée en Latin par Monsieur Graaf, Medécin & célébre Anatomiste de la ville de Delft, en Hollande. Et traduit en François par Monsieur N. P. D. M. *Basel, Emanuel Jean George König*, 1699. 8° : (16) 104 pp., 9 pl. ; (8) 245 [3] pp., 27 pl., 142 [2] pp., 5 pl. (Fig. 8).

Contents: Traité des parties de l'homme (pp. 1-104, 9 pl.) ; Traité des parties des femmes ([8] pp. 1-188, 27 pl.) ; La defense des parties genitales (pp. 189-245) ; Traité du suc pancreatique (pp. 1-110, 3 pl.) ; Traité des clisteres (pp. 111-132, 1 pl.) ; Petit traité de l'usage du siphon (pp. 133-142, 1 pl.).

Note: The date as given on the title-page, M.DC.LXCIX, is obviously a typographical error. *Bibl. med. neerl.* reads it as 1669; a note in the Catchpole copy changes the last "C" to "X" to give 1679. But it would seem more reasonable to delete the "L" to give 1699. Bibl. Nat. and Brunet give this date and the fact that the Warsaw edition of 1701 (No. 20) is the remainder of this printing would render the later date more probable. The author of this translation, Monsieur N. P. D. M. has succeeded in remaining anonymous.

Copies: Catchpole; PPCP; Bibl. Nat. (Ta⁷.7) ; Bibl. med. neerl.; Waller.

20. Nouvelles découvertes sur les parties de l'homme et de la femme qui servent a la generation : avec la deffense des parties genitales, contre les sentiments de quelques anatomistes. Un traité du pucelage, du pancreas, de l'usage du syphon, & des clysteres. *Warsaw, Federic Clouski*, 1701. 8° : (16) 104 pp., 9 pl. ; (8) 268 pp., 27 pl. ; 142 pp., 5 pl. ; (2) 32 pp.

Contents: Traité des parties de l'homme (pp. 1-104, 9 pl.) ; Traité des parties des femmes ([8] pp. 1-188, 27 pl.) ; La defense des parties genitales (pp. 189-245) ; Traité du pucelage (pp. 247(sic)-268) ; Traité du suc pancreatique (pp. 1-110, 3 pl.) ; Traité des clisteres (pp. 111-132, 1 pl.) ; Traité de l'usage du siphon (pp. 133-142, 1 pl.) ; Table des matières (pp. 1-32).

Note: For part of the following description I am indebted to Dr. W. B. McDaniel, II, Librarian, College of Physicians, Philadelphia, Pennsylvania : A note by Stockton Hough in the PPCP copy states this to be the remainder of the Basel edition of 1699 (No. 19). A "*Traité du pucelage*" of unknown authorship has been added, following, and ostensibly continuing the pagination of *Traité des parties des femmes* and *La defense des parties genitales* (*i. e.*, after p. 245). A new "Table des matières" appears at the end of the volume. The title-page omits mention both of de Graaf and his unidentified translator, Monsieur N. P. D. M.

As frontispiece appears an anonymous portrait—certainly not of de Graaf, and scarcely that of the translator. It does bear some resemblance, however, to the well-known anatomist, P. Dionis, but any conclusion that the latter had anything to do with the publication of this work or with the inserted "Traité du pucelage" would be speculative. Brunet (vol. 2, 1786) carries the following note: "C'est la réimpression de l'ouvrage qui avait déjà paru sous le titre d'Histoire anatomique, etc. Basel, 1699."

Copy: PPCP.

HISTOIRE
ANATOMIQUE
DES
PARTIES GENITALES,
DE L'HOMME
Ex libris Claudii ET Gavard D.M.
DE LA FEMME,
QUI SERVENT A LA GENERATION:

AVEC UN TRAITE' DU SUC PANCREATIQUE, DES CLISTERES ET DE L'USAGE DU SYPHON.

COMPOSEE' EN LATIN PAR MONSIEUR Graaf, Medécin, & célébre Anatomiſte de la Ville de Delft, en Hollande.

Et traduit en François par Monſieur N. P. D. M.

Enrichie de quarante une Planches en taille douce.

De Bonnefons

A BALE,
Chez EMANUEL JEAN GEORGE KÖNIG,
M. DC. LXCIX.
Et ſe vend à Lyon chez HILAIRE BARITEL, ruë Merciere à la Conſtance.

Fig. 8.

Title-page of French translation of *Opera omnia*, 1699 (No. 19).

Dutch

21. Alle de wercken, so in de ontleed-kunde als andere deelen der medicyne. *Amsterdam, Abraham Abrahamse*, 1686. 8° : (32) 671 [1] pp.

Contents: Brief aan Silvius [*sic*] ([*8*a*-**3*a*]) ; Antwoordt van Sylvius ([**3*b*-**5*a*]) ; Voor-reeden ([**5*b*-8*b*]) ; Naauw-keurig onder-soek van de voort-teelende ledematen der mannen (pp. 1-144) ; Een nieuw ontwerp van de ledematen der vrouwen (pp. 145-400) ; Verdeediging der voort-teelende ledematen (pp. 401-461) ; Ontleet-genees-konstige beschryvinge van d'eygenschap des al-vleesigen saps (pp. 463-623) ; Verhandeling der clysteren (pp. 625-651) ; Brief aan Plempius (pp. 652-656) ; Korte beschryving van't gebruyk der spuyt (pp. 657-671).

Copies: Fulton; PPCP; Bibl. med. neerl.; Hunt.; Brit. Mus. (7421.aa.5).

X. CONTRIBUTIONS AND COMMUNICATIONS TO JOURNALS

22. Arteriae carotides induratae. *Miscellanea curiosa medico physica Acad. naturae curiosorum, sive Ephemeridum medico-physicarum*, 1670, *1* : 285-286.

23. Monstrosus uterus. *Miscellanea curiosa medico physica Acad. naturae curiosorum, sive Ephemeridum medico-physicarum*, 1670, *1* : 286-288.

24. A specimen of some observations made by a microscope, contrived by M. Leeuwenhoeck in Holland, lately communicated by Dr. Regnerus de Graaf. *Philos. Trans.*, 1673, *8* : 6037-6038.

XI. DOUBTFUL ATTRIBUTION

25. Geschicht historial rym, of Rumchronyk van der Heer Klaas Kolyn beginnende met den simberschem vloed en eyndigende met de dood van Graaf Dirk . . . in't jaar 1156 voorgevalken, zynde voordsnog met de noodige zoo taal als historikundige aantekeningen opgehelderd door Mr. Gerard van Loon - - -'s. *Gravenhaage, P. de Hondt*, 1745. fol. : xii, 477 pp.

The catalogue of the Bibliothèque Nationale asserts this to be a "Chronique rimé de Holland depuis l'invasion des cimbres jusqu'en 1156" and adds "Le veritable auteur de l'ouvrage est Regnerus de Graaf."

Copy: Bibl. Nat. (*2*, "un autre ex. sur gr. papier").

XII. BIOGRAPHY AND CRITICISM

26. Cole, F. J. Early theories of sexual generation. *Oxford*, 1930. 8° : x, 230 pp.

27. Dionis, P. L'anatomie de l'homme suivant la circulation du sang et les dernières decouvertes. [*Paris, Laurent d'Houry*], 1704. 8° : 15 *ll.*, 710 pp., 19 *ll.*

28. Dobell, C. Antony van Leeuwenhoek and his " Little animals." . . . Collected, translated and edited from his printed works, unpublished manuscripts, and contemporary records. . . . *London; John Bale, Sons and Danielsson, Ltd.*, 1932. 8° : viii, 435 pp.

29. Eloy, N. F. S. Dictionnaire historique de la médecine ancienne et moderne. *Mons, H. Hoyois*, 1778. 4 vol.

30. Friedenwald, J., and Morrison, S. The history of the enema with some notes in related procedures. *Bull. Hist. Med.*, 1940, *8* : 68-114.

31. Fulton, J. F. Selected readings in the history of physiology. *Springfield, Ill., Charles C Thomas*, 1930. 8° : xx, 317 pp.

32. Horne, J. van. Suarum circa partes genitales in utroque sexu observationum prodromus. *Leyden*, 1668. 12°.

33. Leonicenus, J. *See* Pechlin, J. N.

34. Molière, J. B. P. Le malade imaginaire. *Strasbourg*, 1674.

35. Pechlin, J. N. Metamorphosis Aesculapii et Appollonis pancreatici. *Leyden*, 1673.

36. Portal, A. Histoire de l'anatomie et de la chirurgie. *Paris, Fr. Didot le jeune*, 1770-73. 6 vol.

37. Rey, A. De Sylvius a Régnier de Graaf. Quelques considérations sur les idees médicales au xxvii[e] siècle. Thèse. *Bordeaux, Imprimerie de L'Académie*, 1930. 8° : 86 pp.

38. Singer, C. *Studies in history and method of science*, 1921, *2* : 285-343.

39. Stensen, Nils. Elementorum myologiae specimen : seu musculi descriptio geometrica. *Florence, Typ. sub signo Stellae*, 1667. 8° : 3 *ll.*, 123 pp., 7 pl.

40. Stirling, W. Some apostles of physiology. *London, Waterlow and Sons*, 1902.

41. Swammerdam, J. Miraculum naturae, sive uteri muliebris fabrica. *Leyden*, 1672. 4° : 4 *ll.*, 57 [1] pp.

42. Vedrani, Alberto. Regner de Graaf. *Ill. med. ital.*, 1920, *2* : 138-141.

ORNITHOLOGISTS OF THE UNITED STATES ARMY MEDICAL CORPS

Part I

LIEUTENANT-COLONEL EDGAR ERSKINE HUME,
Medical Corps, U. S. Army

When the United States Army was playing its mighty part in the winning of the West there was often great opportunity for scientifically minded officers to study bird life in the Territories which, as yet, were hardly known to the white man. The Army was small, and its function was that of a fighting force only. It had nothing of the present additional duty of the Regular Army, the training of the reserves. Medical officers were often exceedingly well-educated men, and when campaigns were not in progress, their spare time was not wasted. Their extra-duty hours were frequently used to the great benefit of science.* Ornithology was a popular study and some of its followers went far in that branch of zoölogy. A few of these medical officers were recognized ornithologists before entering the military service, while others acquired that interest thereafter.

The first recorded ornithological work of Army medical officers was done in the 'Fifties, in connection with the official surveys of the West. Interrupted by the War Between the States, it was resumed in the three decades that intervened between the close of that war and the Spanish-American campaign. Young medical officers, said the scholarly Brigadier-General Walter Drew McCaw, who had been one of them, were usually sent West for duty immediately after being commissioned Assistant Surgeons in the United States Army. Often they were middle-aged men, or older, before they saw service east of the Mississippi, and in those days the West was the West,

* "The writer once heard a learned scientist at the National Museum make the remark that if he wanted any information in the domain of natural history, ethics or positive science, he could always get such information as he wanted from an officer of the Army Medical Corps. The writer, remembering the many officers of the Medical Corps who, as a recreation, took up various lines of study, is able to vouch for this assertion" (Dr. Henry Crècy Yarrow's "Personal Recollections of old Medical Officers," *The Military Surgeon*, May, 1927, lx, no. 5, 588).

with all its charm, romance and danger. When not accompanying military organizations following hostile Indians, many of these medical officers were following and studying birds. A smaller group of medico-military ornithologists served likewise in Army posts in the East. The number of specimens that they collected and the number of valuable reports that they wrote and the articles that they published are nothing less than amazing. Not a few of them wrote monographs and texts still in use, held office in ornithological societies in this and other countries, and edited journals devoted to this subject, while several are acknowledged as being among America's greatest naturalists.

The ornithological work done by Army medical officers in the West between 1850 and 1860 was largely inspired by the great Professor Spencer Fullerton Baird (1823-1888), of the Smithsonian Institution. It is not possible to consider their studies without mentioning Professor Baird's career. He was Professor of Natural History at his alma mater, Dickinson College, thereby acquiring a title that he always used thereafter. He inaugurated in America the method of field study of zoölogy and botany so successfully used already by Agassiz in Switzerland. He went to the Smithsonian Institution in 1850 as Assistant Secretary, the secretaryship then being held by the venerable physicist, Joseph Henry. In 1878 Baird was unanimously elected Secretary.* Among his original duties as "Keeper of the Cabinet" was "to take charge of the making of collections for the Smithsonian Museum and to request officers of the Army . . . and of other persons such assistance as might be necessary for the accomplishment of the intended object" (*Dict. Amer. Biogr.*, i, 513). One of his ideals was that of coöperating bureaus of science, joined as associates and friends, and not as rivals. Baird married the daughter of Colonel Sylvanus Churchill, Inspector General of the Army, through whose influence, it has been said, he was able to obtain the services of the youthful medical officers as

* The Smithsonian Institution was created in 1838 by the bequest of James Smithson, British chemist and mineralogist, natural son of Hugh Smithson, first Duke of Northumberland. Its administrative head is known as Secretary, an office held by Professor Baird from 1878 until his death a decade later. The Smithsonian Institution is divided into several divisions, one of which is the United States National Museum.

naturalists and surgeons of the several railway and other expeditions in the West.

Much of the record of the ornithological activity of the Army Medical officers is preserved in the pondrous tomes of the reports of these expeditions. The purposes of the Pacific Railroad Surveys, as they are commonly called, the reports of which fill some fourteen quartos, are thus set forth therein:

> Shortly before the close of the session of Congress in March, 1853, an appropriation of $150,000 was made to defray the expenses of the survey of the various routes along which it was supposed that a railroad might be constructed from the Mississippi River to the Pacific Ocean. For this purpose six parties were organized by the War Department for the survey of four main routes; and in a short space of time they were in the field. All the parties were fitted out in the most complete manner; the natural history apparatus and material prepared under the direction of the Smithsonian Institution, which also furnished the necessary instructions as to the objects most important to be collected. In its efforts to secure the assignment to these parties of persons capable of making collections and observations in natural history, it was met by the hearty cooperation of the War Department, through the heads of the different expeditions, and Captain Humphreys, in charge of the Pacific Railroad Office (viii, p. xiii).

The names of the officers in charge of the several expeditions with the surgeon-naturalists attached are:

1. Line of the 47th Parallel, under Governor Stevens; Two distinct parties, one under Governor Stevens himself, with Acting Assistant Surgeon George Suckley as naturalist; the other under Captain George Brinton McClellan (the future general) with Acting Assistant Surgeon James Graham Cooper as naturalist.

2. Line of the 35th Parallel, under Captain Amiel Weeks Whipple, with Acting Assistant Surgeon Caleb Burwell Rowan Kennerly as surgeon and naturalist.

3. The California Line, under Lieutenant Robert Stockton Williamson, with Acting Assistant Surgeon Adolphus L. Heermann as surgeon and naturalist.

4. Line of the 32nd Parallel, East, under Captain John Pope, with Assistant Surgeon Thomas Charlton Henry as surgeon and naturalist.

5. Line of the 32nd Parallel and California, under Lieutenant John Grubb Parke, accompanied by Acting Assistant Surgeon Thomas Antisell as surgeon and geologist.

6. Explorations of Red River by Captain Randolph Barnes Marcy, aided by Captain George Brinton McClellan, accompanied by Assistant Surgeon

George Getz Shumard, as surgeon and naturalist. The following army medical officers were also engaged in work as naturalists as well as surgeons, in this group: Assistant Surgeon John Fox Hammond (at Fort Reading and San Diego), Assistant Surgeon William Shakespeare King (at San Diego), Assistant Surgeon Ebenezer Swift (at Fort Chadbourne, Texas), Dr. William Wallace Anderson (at Fort McKavit), Assistant Surgeon Lewis A. Edwards (in Texas and Arkansas), Assistant Surgeon Samuel Wylie Crawford (at Fort Bliss, Texas), Assistant Surgeon William Alexander Hammond (at Fort Riley and Fort Kearney), Assistant Surgeon John Frazier Head (at Fort Ripley, Minnesota). Assistant Surgeon Hammond was assisted by Hospital Steward and future Professor John Xanthus de Vesey and Assistant Surgeon Richard Potts (at Fort Jones) (*loc. cit.*).

Governor Stevens, in his introduction to the Pacific Railroad Survey, says:

> On the 8th of April, 1853, I was assigned to the duty of exploring a route for the Pacific railroad from St. Paul, or some eligible point on the Upper Mississippi, to Puget Sound. My instructions required me to examine carefully the passes of the several mountain ranges, the geography and meteorology of the whole intermediate region, the character, as avenues of trade and transportation, of the Missouri and Columbia Rivers, the rains and snows of the route, especially in the mountain passes, and, in short, to collect every species of information bearing upon the question of railroad practicability. It was necessary, moreover, to give great attention to the Indian tribes, as their friendship was important to be secured, and bore directly upon the question both of the Pacific railroad and the safety of my party.
>
> As the route was comparatively new and unexplored, it was determined to organize the whole command into two divisions—the eastern division being under my immediate direction, and the western division under Captain George B. McClellan, of the corps of engineers, who was ordered to report to me. . . .
>
> To this party were assigned Lieutenant J. K. Duncan, United States Army, and Dr. J. G. Cooper, surgeon and naturalist. Lieutenant Duncan left New York on the 5th of May, and was instructed to repair to the Columbia river, and make every possible arrangement in the way of collecting transportation and supplies in anticipation of the arrival there of Captain McClellan, who being in Texas at the time of his assignment to the command of the western division, was necessarily late in reaching Washington city. Dr. Cooper accompanied him. Captain McClellan arrived on the 8th of May, and, besides the charge of the western division, was, under the direction of the Secretary of War, assigned to the charge, under my general supervision of opening the military road from Fort Steilacoom to Fort Walla-Walla. . . .
>
> The eastern division was provided with the following corps of officers and civilians for the scientific objects of the exploration, and for the quarter-

master and commissary duties: Captain J. W. T. Gardiner, 1st dragoons; Lieutenant A. J. Donelson, Corps of Engineers, with ten sappers and miners; Lieutenant Beekman DuBarry, 3d artillery; Lieutenant Cuvier Grover, 4th artillery; Lieutenant John Mullan, 2d artillery; Isaac F. Osgood, disbursing agent; J. M. Stanley, esq., artist; Dr. George Suckley, surgeon and naturalist; F. W. Lander and A. W. Tinkham, assistant engineers; John Lambert, topographer; George W. Stevens; William M. Graham and A. Remenyi, in charge of astronomical, and magnetic observations; Joseph F. Moffatt, meteorologist; Thomas Adams, Max Strobel, Elwood Evans, F. H. Burr, and A. Jekelfaluzy, aids; and T. S. Everett, quartermaster and commissary's clerk. . . . (Narrative and Final Report of Explorations for a Route for a Pacific Railroad etc., by Isaac I. Stevens, Governor of Washington Territory, 1855, pp. 31-33: Executive Document No. 56, 36th Congress, 1st Session, 1860. This constitutes Volume xxi, Book I of the Reports of Explorations and Surveys to Ascertain the Most Practicable and Economic Route for a Railroad from the Mississippi River to the Pacific Ocean, made under the direction of the Secretary of War.)

In Governor Stevens's general instructions for the expedition, dated 21 May 1853, there occur the following paragraphs:

7. Each officer and scientific man of the expedition will keep a daily journal, noting everything worthy of observation of a general character. These journals will be deemed a part of the results of the expedition, will be turned over as a part of its archives, and will be made use of in preparing the report.

10. Professor Spencer F. Baird is the naturalist of the expedition. The naturalists and collectors, for full information in reference to their duties, are referred to his printed notes prepared for this expedition, and his printed directions prepared for the Smithsonian Institution. The collections will all be sent to him in Washington for the purpose of that portion of the report.

15. Mr. Stanley is appointed artist of the expedition." (One of Stanley's sketches in which Surgeon Suckley, one of our ornithologists, is depicted will be described presently.)

Among the directions of Professor Baird are these:

As the expedition will pass through the breeding-ground of many species of birds whose nidification and eggs are not known, attention should be paid to securing abundant specimens of the nests and eggs. As far as possible the skin of the bird to which each set of eggs may belong should be secured, and have a mark attached common to it and the egg (p. 3; 7, *ibid.*).

With the acquisition of tropical possessions in America and Asia at the turn of the century, new and wider fields for ornithological

study were opened to medical officers of the U. S. Army. Once more they were not slow to do their part, as several of the following biographies will show.

The brother medical officers of these Army ornithologists, no less than their brother physicians in civil life, have not always been familiar with their achievements, which deserve ... memories and our respect. What they did reflected credit on the Corps of which they were a part. Like the meteorologists of the Army Medical Corps, they played a leading part in developing a science akin to medicine, but not sufficiently nearly related to be daily before the eyes of the average medical man. On the other hand, ornithologists in recognizing the zoölogical work of these scientists, may overlook their connection with the Army.

In preparing the biographies of these medico-military ornithologists, something of each officer's career as a whole is given. It is not possible always to separate the ornithological work from other activities, and the personal and military side is often of considerable general interest. Thus it will be shown that some of our group were distinguished as explorers, as ethnologists, as fighting men (one won the Medal of Honor, highest American decoration), as writers, as artists, as naturalists in other fields (herpetology, botany, and geology), and so forth.

It would not seem difficult, for our present purpose, to define the term "ornithology." Mr. Noah Webster tells us it is "that branch of zoölogy which treats of birds," while the Standard Dictionary (Funk and Wagnalls) has it, "the branch of zoology that treats of birds, their form, structure, habits, classification, etc." The Century Dictionary, of which Surgeon Elliott Coues, most distinguished of our group of ornithologists, was an editor, gives this definition: "That branch of zoölogy which relates to birds. The scientific study or knowledge of birds. Field ornithology is the study of living birds as distinguished from closet ornithology or the technical study of the dead bodies of birds for purpose of classification or nomenclature." Regarding ornithology, in the somewhat narrower sense, no effort has been made to include in this study the adjacent fields of avian pathology, for instance, though not a little has been done therein from the time of Surgeon Joseph Leidy of Philadelphia,

that fine old cavalry medical officer who wrote on endoparasites of birds, to modern researches of Whitmore, Callender and Simmons. Colonel Eugene Randolph Whitmore of the Army Medical Corps, while a member of the Army Medical School faculty, published "Observations on bird malaria and the pathogenesis of relapses in human malaria," *Bulletin of the Johns Hopkins Hospital*, 1918, xxix, 62-67. Colonel George Russell Callender and Lieutenant-Colonel James Stevens Simmons, Medical Corps, U. S. A., while serving as members of the Army Medical Research Board in the Canal Zone, published "Trichomoniasis (*T. columbæ*) in the Java Sparrow (*Munia oryzivora*), Tovi Parrakeet (*Brotogeris jugularis*), and Verraux's Dove (*Leptotila verrauxi verrauxi*)," *American Journal of Tropical Medicine*, July, 1937, xvii, no. 4, 579-585. The condition described is sometimes known as bird diphtheria.

In the following biographic sketches of ornithologists of the Army Medical Corps, extracts, where practicable, of their writings have been given. The scientific names of the birds described are those used by the several authors themselves, or which were accepted in their time. Of course, many of these names have been changed, but present equivalents are not given, for the names may be changed again as time goes on.

It seems appropriate to give here a few general considerations of the rank and position of United States Army medical officers during the periods in which the chief ornithological work, herein described, was done.

The Surgeon General of the Army during the period of the work of the Pacific Railroad Expedition and other expeditions of the 'Fifties, was the colorful Thomas Lawson of Virginia, a man whose policy was always to support scientific work on the part of his subordinates. The United States Army was small, the Medical Department particularly so. In 1855 Surgeon General Lawson requested Congress to increase the number of medical officers authorized by law, saying that while he was supposed to have ninety-four surgeons and assistant surgeons, he had rarely more than eighty-five such officers available for duty. With this small number of officers it is not surprising that the rank of the Surgeon General was only that of Colonel. Indeed Lawson's predecessor, Surgeon General Lovell,

did not have any relative military rank. The first Surgeon General to hold the grade of Brigadier-General was William Alexander Hammond (1862), while the grade of Major-General was not authorized for the Surgeon General until the administration of William Crawford Gorgas, who was Surgeon General during the World War.

It was 1906 when medical officers were given the titles they now hold, previously being known by such titles as Assistant Surgeon (ranking as First Lieutenant), Assistant Surgeon (ranking as Captain), Surgeon (ranking as Major), Deputy Surgeon General (ranking as Lieutenant-Colonel) and Assistant Surgeon General (ranking as Colonel). There were also certain medical officers holding the grades of Chief Medical Purveyor (Colonel) and Assistant Medical Purveyor (Lieutenant-Colonel). At times the title Medical Inspector connoted Lieutenant-Colonel and Medical Director corresponded to Colonel.

Congress in 1904 enacted a law whereby officers who had served in the Civil War were given advanced rank on retirement, or were advanced one grade if already retired. Under this law several of the officers to be considered were promoted. Through the War of 1861-5 and for some years thereafter there was the old system of conferring brevets for special services. Such brevets were comparable to such modern decorations as the Distinguished Service Medal, Distinguished Service Cross, etc. Many of our ornithologists received such brevets, often with the citation " for meritorious and faithful services in the late war," or with special wording recalling special deeds. Just after the World War Congress created the grade of Brigadier-General: Assistant Surgeon General, United States Army, there being two and later four such officers. Two of our ornithologists attained this rank.

It has been found necessary to limit the sketches to consideration of officers of the Regular Army, including Acting Assistant Surgeons (Contract Surgeons). The United States Army as a whole had no reserve prior to the National Defense Act of 1916 which created the Officers' Reserve Corps. There was, however, the Medical Reserve Corps, established in 1908, and made up of a varying number of officers, all of the grade of First Lieutenant. The Medical

Reserve Corps consisted of a small number of officers attending the Army Medical School as candidates for admission to the Medical Corps, and a very much larger group of officers serving at various posts and stations throughout the Army. Their service was necessary because the Medical Corps had not been authorized by Congress to admit a sufficiently large number of officers to perform the duties devolving on it. These officers of the Medical Reserve Corps corresponded in function and status, more or less, to the Acting Assistant Surgeons of an earlier day. Contract Surgeons still exist in the Army, but they are usually employed on part time duty only.

The older Contract Surgeons, always officially known as Acting Assistant Surgeons, were for the most part men who for one reason or another could not, or did not, enter the Medical Corps. Without them it would have been impossible to render adequate medical service to the Army. The Medical Corps has always been too small. This was particularly so prior to the War Between the States, a period during which was done some of the most important ornithological work hereinafter described. At the outset of the War of 1861 "the medical department of the United States army was composed of one surgeon-general with the rank of colonel, thirty surgeons with the rank of major, and eighty-four assistant surgeons with the rank of first lieutenant for the first five years service" (*Medical History of the War of the "Rebellion,"* pt. iii, Surgical Volume, 899). Though this total number of medical officers (115) was increased to 189 by the Act of 16 April 1862, a far larger group of medical officers was needed. The state troops or militia had their own medical officers. The War Department appointed 547 surgeons and assistant surgeons of volunteers. But throughout the war the medical personnel needed for the great expansion was made up largely of Acting Assistant Surgeons, of whom 5,532 were employed.

Many Acting Assistant Surgeons served continuously, not only throughout the war but long afterwards. Some of them, for instance Dr. Yarrow, whose biography is given below, served for more than thirty years. Such men may well be considered a part of the Regular Army. Not a few of them became officers of the Regular service after having been Acting Assistant Surgeons.

There has been a sore temptation to include a number of prominent ornithologists who held emergency commissions in the Army of the United States during the World War. This impulse had to be resisted because there was no way of being sure of a complete list, and because of limitations of space. The names of some of these officers have been obtained from Dr. Theodore S. Palmer, long Secretary of the American Ornithologists' Union, and are given below. Most of them did, or are still doing, their ornithological work entirely independently of their military service, that is, before being commissioned, or after leaving the Army.

May the following pages serve to recall to the medical profession of the present, which seems but seldom to have time or inclination to pursue this charming science, the valuable work of past and present colleagues. The author is all the more happy to do this because he cannot himself claim knowledge of ornithology, but only admiration from a respectful distance.

William Wallace Anderson (1824-1911)

Assistant Surgeon, United States Army; Surgeon, Confederate States Army

William Wallace Anderson was born on 14 December 1824 at The Borough House, the estate of the Andersons at Statesburgh, the High Hills of Santee, Sumter County, South Carolina. He was the third son of Dr. William Wallace Anderson (1789-1864) and Mary Jane McKenzie, his wife. The elder Dr. Anderson was a distinguished surgeon and scholar, to whom has been credited the first operation on record for the removal of the lower jaw for cancer. He was interested in natural history, particularly botany, so that the tastes of his son are easily understood.

The younger William Wallace Anderson graduated from the University of South Carolina in the class of 1846 and studied medicine at the University of Pennsylvania, where he received the degree of Doctor of Medicine in 1849.

On 20 March of that year he took the competitive examination for admission to the Medical Department of the United States Army before the Examining Board in New York City and was one of three

Fig. 1.

WILLIAM WALLACE ANDERSON.
(1824-1911)

Assistant Surgeon (First Lieutenant), United States Army.

From a Daguerreotype made about the time he entered the Army in 1849.
In the possession of his daughter.

successful candidates from a class of seventy. He was commissioned Assistant Surgeon on 26 June 1849.

From this time until the outbreak of the War Between the States he served at various Army posts in Texas and New Mexico, where he was attached to a cavalry regiment. After five years service he was promoted Assistant Surgeon with the rank of Captain.

Assistant Surgeon Anderson was one of the young naturalists assigned by the War Department to the Pacific Railroad Surveys. Like others of that group he worked under the supervision of Professor Spencer Fullerton Baird of the Smithsonian Institution. In the Preface to his report on the birds collected by the expeditions, Baird says that "Dr. W. W. Anderson, U. S. A." collected specimens at Cantonment Burgwyn, New Mexico, and forwarded them to him (p. xv).

Among such birds Baird notes the White-tailed Ptarmigan, *Lagopus leucurus* Swainson, which Anderson collected in January, 1858, "on the west side of the Rocky Mountains, near Cochetope Pass, latitude 39°". Assistant Surgeon Anderson was at the time working under Captain Randolph Barnes Marcy, Fifth Infantry, United States Army.

In Appendix A to his report, Professor Baird says:

> I am enabled to make some important corrections and additions in reference to the number of species, as well as to their synonymy and localities. These are based on collections made at quite a late period by Mr. J. Xanthus de Vesey [*q. v.*] at Fort Tejon, California, Dr. W. W. Anderson, U. S. A. at Cantonment Burgwyn, New Mexico, and Mr. C. Drexler at Fort Bridger, Utah. (p. 921)

> *Selasphorus platycercus* Gould [Broad-tailed Hummingbird]. Numerous specimens of this species have lately been received from Cantonment Burgwyn, N. M. (Dr. W. W. Anderson), and at Fort Bridger, showing it to be a common bird of the Rocky Mountains, and probably ranging far north. The female lacks the red throat and the green of the sides, which, with the crissum, are tinged with reddish, as in *S. rufus*, from which it differs in the absence of this color on the bases of the rump feathers. The tail is rounded, and lateral feathers wider than in *S. rufus*, broadly tipped with white. All are strongly edged and tinged towards the base with brownish red, less conspicuously than in *S. rufus*. (p. 921)

Other specimens sent to Professor Baird by Assistant Surgeon Anderson, as noted in the Appendix A, are:

Dendroica townsendii Baird
Picicorvus columbianus Bonaparte (Clarke's Crow)
Cyanura macrolophus Baird (Long-crested Jay)
Cyanocitta woodhousii Baird (Woodhouse's Jay) (pp. 923, 925).

That Anderson should have become interested in ornithology may be appreciated by an anecdote of him as a boy. In the words of his granddaughter:

> In everything that he did he was methodical and accurate. It is told of him that as a boy he was most skillful at throwing stones. On one occasion seeing a woodpecker at work on a tree, he observed that its head appeared above a limb with regular periodicity. He timed his stone to reach this point when the woodpecker's head emerged. The stone met its mark and killed the woodpecker. (Notes of Mrs. White.)

He had rare ability to draw from nature, though he had never had lessons in this art. His sketchbook in which he made drawings of the West is most interesting and has been preserved. The sketches are accurate to minute details. One of the drawings in the book is the only known illustration of Fort Burgwyn, New Mexico (see Figure 2). Anderson's drawing of "The Needles" appears as an illustration in "The Prairie Traveler" by Captain Marcy, his commanding officer. Dr. Anderson also drew exquisite miniatures of his children in pencil. Not only did he make sketches of birds. He engraved his own copper plates! One of them is here reproduced It is the Blue-headed Flycatcher, *Musicapa solitaria*, now known as *Vireo solitarius solitarius* (Figure 4).

The following records of Assistant Surgeon Anderson's service in the United States Army were kept by the Surgeon General and are now in the National Archives:

October, 1849 serving at Fort Polk, Texas
16 February, 1850—Reported his departure with two companies of infantry to Fort Merrill, a new post established on the Nueces River, between the junction of that river with the Rio Frio and the town of San Patricio. Fort Polk had been abandoned.
April 1852—Moved to a new post, Fort Territt, on the Llano River.
April, 1853—Transferred to Fort Duncan, accompanying a battalion of infantry.
15 August, 1854—Relieved from Fort McKavett, at which he had

Fig. 2.

CANTONMENT BURGWYN, NEW MEXICO.

Drawn by Assistant Surgeon William Wallace Anderson, United States Army.

This is the only known picture of this famous Army post, noted for the great variety of birds collected here by Army medical officers

been serving. Given leave of absence at Statesburgh, South Carolina.

1855—Ordered to New Mexico, via New Orleans and the Arkansas River.

17 October 1855—Reached Fort Arbuckle.

21 August 1856—Reported from Carlisle Barracks, Pennsylvania.

31 March 1857—Serving at Cantonment Burgwyn, New Mexico.

10 April 1857—Serving at Fort Union.

18 November 1858—Serving in the field with a column of troops against the Navajo Indians.

31 July 1860—Arrived at Fort Clark, Texas.

27 September 1860—Assigned to Fort Chadbourne, Texas.

16 October 1860—Reached Fort Chadbourne, Texas.

6 April 1861—Given 20 days leave of absence.

16 May 1861—Resignation as an officer of the Army accepted by Special Order No. 134, Adjutant General's Office, War Department, effective April 20th.

On the acceptance of his resignation, Dr. Anderson came East to offer his services to the Confederate Government at its first capital, Montgomery, Alabama. When the Government removed to Richmond, Anderson followed and reported to the temporary Surgeon General, C. S. A., Dr. David Camden De Leon. Anderson was commissioned Surgeon, Confederate States Army. His commission is in the possession of his grandaughter, Mrs. White. His first assignment was as Medical Director and Purveyor at Winchester, Virginia, under General Joseph Eggleston Johnston.

He was on duty in Nashville when Fort Donelson was captured and General Albert Sydney Johnston moved to Corinth.

The following order is preserved in the National Archives, Washington:

General Orders No. 57 — Headquarters, Department of Mississippi and East Louisiana, Jackson, April 1, 1863

Surgeon W. W. Anderson having been assigned to duty by the War Department as Medical Director of General Hospitals in this command, is, in addition, assigned to duty until further orders as Medical Director of this Department.

By Order of Lieutenant-General Pemberton

(*"Rebellion" Records,* first series, xxiv, 709.)

He continued on this duty until after the fall of Vicksburg. He proceeded thereafter to Marion, Alabama, and was assigned by Surgeon General Moore as Inspector of Hospitals and Camps of North Carolina, South Carolina and Georgia. In 1864 he was relieved from this duty and appointed "Medical Inspector and Superintendent of Vaccination of the Armies, Hospitals and Camps of Instruction of the Confederate States." He served in this position, one second in importance only to that of the Surgeon General himself, until the close of the War, at which time he held the relative rank of Major.

Anderson's work as a naturalist is shown by the following letters to him from Prof. Spencer Fullerton Baird:

Smithsonian Institution
Washington, D. C.

October 15, 1860

My dear Doctor:

On my return home the beginning of this month I found the two boxes from you: one from Burgwyn, and the other containing your Texas things. I found a great many rare birds and other specimens in both, but the Texas box was especially important in having, among other specimens, one of the only species of hawk wanting to our collection, namely the Falco femoralis. Think of that! There were also eggs of two hawks new to our collection, Buteo swainsoni and Accipiter mexicanus. Think of that again!

In the Burgwyn box were the second and third specimens of the Colorado Raven besides such varieties as Cassin's Purple Finch, Maximilian's Jay, etc.

I really don't see how we are to get along without you at Burgwyn. It is certainly the greatest centre of rare birds in the United States. I would write more but I do not know whether or how soon you will get this letter. I will send it to the Surgeon General's Office. Let me know where you are and I will write again.

Sincerely yours,

Spencer F. Baird.

Dr. W. W. Anderson, U. S. A.

(Original in possession of Dr. Anderson's granddaughter, Mrs. White.)

After the War Between the States was over and South Carolina was in the midst of horrors of "Reconstruction," Anderson continued his interests in natural history and from time to time contributed specimens to the Smithsonian Institution. Part of one of Professor Baird's letters to him is preserved. The beginning, with date, is unfortunately lost. . . .

Fig. 3.

WILLIAM WALLACE ANDERSON.
(1824-1911)

Assistant Surgeon (Captain), United States Army.
From a Daguerreotype made about the time of his promotion to that grade.
In the possession of his daughter.

. . . Are you in the way at all of coming across Indian relics, remains of stone implements, pottery, pipes, etc? We are very anxious to get what we can of these both for the Centennial Exposition [1876] and for our own Museum. Please remember us when you get a chance in this way or any other directions. Believe me,

Sincerely yours,

Spencer F. Baird.

To Dr. W. W. Anderson, Statesburgh, Sumter Co., So. Carolina.

(Original in possession of Mrs. White.)

Dr. Anderson married in 1855, Mary Virginia (1833-1912), daughter of Brigadier-General Thomas Childs, U. S. Army, (1796-1853) of Massachusetts. The wedding took place at Wilmington, North Carolina, where General Childs formerly was stationed. Immediately afterwards, Dr. and Mrs. Anderson set out for New Mexico, traveling in an Army wagon, accompanied by a company of troops to which Assistant Surgeon Anderson was attached. The bride took along her piano but by the time they reached their destination the instrument was almost a total wreck. Anderson, who was always noted for his mechanical skill, repaired and tuned it so that it was serviceable.

In 1858 Dr. Anderson collected a new species of warbler and sent it to Prof. Baird at the Smithsonian Institution. At Anderson's request, Baird named it *Helminthophagia virginiæ*, in honor of Virginia Anderson, the doctor's wife. The name of this bird has since been changed to *Vermivora virginiæ*, and is commonly known as Virginia's Warbler. It was collected at Cantonment Burgwyn.

Dr. and Mrs. Anderson had nine children: Woodbury (b. 1857), Thomas Childs (b. 1858), Elizabeth (b. 1859), William Wallace (b. 1859), Ann Catherine (b. 1861), Frederick Childs (b. 1866), William Wallace 2nd (b. 1869), Mary Virginia (b. 1872), and Benjamin McKenzie (b. 1875).

Anderson's interests in natural history were not only in the field of ornithology. He studied botany as well. "There are several plants growing today," writes his granddaughter, Mrs. White in 1940, "in the garden at The Borough House which came from seed which during this period he sent home to his sister."

Dr. Anderson died at The Borough House, in which he was born, on 27 June 1911. He and his father together completed one hundred

Fig. 4.

The Blue-headed Flycatcher, *Musicapa solitaria*, now *Vireo solitarius solitarius*
(Cf. *Check List of North American Birds*, American Ornithologists Union, p. 276)

Drawn and engraved on copper by Assistant Surgeon William Wallace Anderson, U. S. A.
From the original plate owned by his granddaughter, Mrs. Walter C. White

and one years of medical practice in this place, allowing, of course, for the son's absences in the military service. Both men were naturalists with wide interests. Both made meteorological observations over a period of many years. The elder was a voluntary observer to the time of his death, while his son, both as required of an Army medical officer and as a private individual later, sent his records to the Surgeon General of the Army and later to the Weather Bureau as long as he lived. (*Cf.* E. E. Hume, The Foundation of American Meteorology by the U. S. Army Medical Department, *Bulletin of the History of Medicine*, The Johns Hopkins University, February, 1940, viii, No. 2, 202-238). Letters are preserved in the Anderson family thanking the two doctors for their valuable contributions to the Government's records.

Surgeon Anderson was one of the earliest members of the National Geographic Society. Like his father and grandfather before him, he was a member of the Society of the Cincinnati (admitted in 1906). The grandfather was Colonel Richard Anderson of the Maryland Continental Line, an original member of the Cincinnati. Surgeon Anderson was a devoted son of the Episcopal Church, and for many years represented the Church of the Holy Cross at Diocesan Councils being also vestryman, senior warden and, on occasion, a lay reader.

Dr. Anderson had two brothers in the Confederate States Army. The elder was Lieutenant-General Richard Heron Anderson (1821-1879), senior South Carolina officer in the Confederate Army. Younger than Dr. Anderson was his other brother, Captain Edward McKenzie Anderson, who fell at the battle of Williamsburg, 5 May 1862, while serving on his elder brother's staff.

PRINCIPAL BIOGRAPHIC SOURCES

1. F. B. Heitman, Historical Register of the United States Army, i, 165.
2. MS notes of Dr. T. S. Palmer, sometime Secretary of the American Ornithologists' Union.
3. MS notes of Mrs. Walter Charles White (née Mary Virginia Saunders) of Gates Mills, Ohio, granddaughter of Dr. Anderson. These notes were prepared by her mother, Mrs. Ann Catherine Anderson Saunders (1864-1928), daughter of Surgeon Anderson.
4. Bryce Metcalf, "Original Members, and Other Officers Eligible to the Society of the Cincinnati," 34.

5. W. S. Thomas, Members of the Society of the Cincinnati, 1929, 19.
6. J. P. Parler, "Afterglow. A Record of Two Centuries of Living at Borough Plantation," *The South Atlantic Quarterly*, January, 1938, xxxvii, No. 1, 73-85.
7. MS records of the Surgeon General of the Army, National Archives.
8. Official Records of the Union and Confederate Armies, War of the "Rebellion," 1st series, xxiv, 709.

Charles Emil Bendire (1836-1897)

Brevet Major, United States Army

The Medical Department of the United States Army claims Major Charles Bendire as one of its ornithologists. Though retired finally as an officer of the line, after several years of commissioned service in the infantry and the cavalry, he was previously a Hospital Steward, a grade corresponding to the present noncommissioned rank of Sergeant. It was while serving as a Hospital Steward that his services were found of sufficient merit to warrant his being made an officer, which is all the more reason for the Medical Department to feel proud of his record.

Our best biographic sketch of his career is from the pen of his intimate friend, Surgeon James Cushing Merrill, who was able to judge him both as an officer and as an ornithologist. From this the following account is largely drawn. "I have known [Bendire] for more than twenty-two years, first as a correspondent, and later as an intimate personal friend, our intercourse closing with a letter written by him a few days before his death," said Merrill.

Karl Emil Bender was born at König im Odenwald in the Grand Duchy of Hesse-Darmstadt on 27 April 1836. The eldest of a family of two sons and three daughters, he received private instruction at home until he reached the age of twelve; thereafter, passing five years at a theological seminary at Passy, near Paris. What used to be called "youthful peccadilloes" resulted in his leaving this school precipitously. He returned home for a short time and then, upon the advice of a friend, and accompanied by his brother Wilhelm, embarked for New York in 1853.

The New World did not at first meet their glowing expectations

and shortly thereafter Wilhelm Bender sailed once more for Europe, but was lost overboard during the voyage.

Karl Emil Bender enlisted in the First Dragoons, United States Army on 10 June 1853, and Anglicized his name to Charles Bendire. About 1883, but a few years before he retired from the Army, he added a middle initial " E " to indicate Emil, but in all official Army records he is still known as Charles Bendire. He was a kinsman of Weyprecht and Payer, the Austrian Arctic explorers who discovered and named Franz Josef Land.

The first five years of his military career were spent as a private and corporal in Company D of the First Dragoons. At the end of this enlistment he remained out of the service for about a year but like many another soldier who has tried civil life, he returned to the colors. He reenlisted on 8 June 1860 in the Fourth Cavalry where he rendered good service as shown by his advancement from private to corporal, sergeant, and finally Hospital Steward.

As Hospital Steward he served through the greater part of the War between the States and was discharged from this grade on 18 May 1864 to accept the commission of Second Lieutenant, Second Infantry. On 9 September, 1864, he returned to the mounted service, being transferred as Second Lieutenant, First Cavalry. On 12 November 1864, he was promoted First Lieutenant. On 21 February 1873, he attained the grade of Captain. He served as such until 24 April 1886, when he was retired for disability,—an injury to his knee, incurred in line of duty.

He received the brevet of First Lieutenant, 11 June 1864, for " gallant and meritorious services in the battle of Trevellion Station, Virginia "; and the brevet of Major, 27 February 1890, for " gallant services in action against Indians at Canyon Creek, Montana, 13 September 1877." (Heitman, *Historical Register of the United States Army*, i, 209.

Bendire's interest in birds began while he was an enlisted man, serving at Cantonment Burgwyn, New Mexico, and at Forts Bowie, McDowell, Wallen, Lowell and Whipple, Arizona, but he had little opportunity to collect material then, nor during the strenuous days of the War Between the States.

In 1867 he paid a three months' visit to his old home in Germany.

Returning to the United States, he was stationed in Louisiana. His other details were: Drum Barracks (now San Pedro), California to April, 1868; at Fort Lapwai, Idaho, to June 1871; at Camp Lowell, Arizona, to January 1873; on recruiting service at St. Louis until September 1874; at Camp Harney, Oregon, to May 1878; at Fort Walla Walla, Washington, to May 1882; at Fort Klamath, Oregon, to September 1883; in the East for about one year and at Fort Custer, Montana to December 1885, being retired in the following spring while still stationed at this post.

This period of more than two decades was marked by numerous Indian troubles, and in these Bendire played an active and important part.

> The Indians learned to fear; and at the same time, to respect him, for he was relentless in their pursuit when they were obviously in the wrong, he never deceived them, and once it is said, during the Apache War, boldly visited the camp of one of the most savage chiefs, Cochise, and prevailed upon him to abandon the warpath. If all the dealings between the white and red races could have been in the hands of such men as Bendire, civilization would not have so much to blush for. (F. H. Knowlton, *The Osprey*, March, 1897, i, no. 7, 87-90.)

Major Bendire also conducted or was engaged in numerous surveys for roads, telegraph lines, and the general exploration of unknown territory. In April and May, 1867, he commanded the first military expedition through Death Valley, California, and also explored the deserts of southern Nevada.

> While engaged in these surveys and explorations Bendire's manner of dealing with men under him was such as to speedily command their best energies and esteem. After ascertaining what was a reasonable day's work he set a task for each, on the completion of which the man was free to do whatsoever he pleased for the balance of that day. If he could accomplish his task by eleven o'clock he was free to hunt or fish, or climb nearby mountain peaks until dark. As the result of this stimulus and confidence, his men accomplished twice the amount of work that other commands were able to do. (Knowlton, *loc. cit.*)

This varied service in parts of the country then but little known to people east of the Mississippi, gave Bendire exceptional facilities for collecting birds and studying their habits in regions theretofore all but unknown to ornithologists.

During these years he saw much hard field service which he performed with the care and fidelity that characterized all that he did. It should be recorded that the testimony of those who accompanied him while in the field is unanimous to the effect that he never allowed his interest in birds to interfere in the least with the strict performance of duty; and more than one anecdote is related of his losing valuable specimens through his unwillingness to delay his command for a few moments.

It is probable that while stationed at Fort Lapwai, Idaho, from 1868 to 1871, Major Bendire first began the systematic study and collection of objects of natural history, and that he was led thereto by his fondness for hunting and interest in the haunts and habits of game mammals and birds. During the early period of his work Major Bendire, while a most assiduous and successful oölogist, paid little attention to collecting birds except for the purpose of identifying sets of eggs. This was unfortunate, because he thus failed to add a number of southern species to our fauna in localities where, at a later period, many such were secured by other collectors. Still, he first obtained in the United States several Mexican species and discovered certain new ones, as *Peucæa carpalis* and *Harporhynchus bendirei*; he was also the first to investigate the breeding habits and procure the eggs of a considerable number of our western birds.

Many ornithologists do not, perhaps, realize that Major Bendire was an assiduous collector in other fields and that at the instance of Professor Baird he sent much good material to the National Museum. In addition to the three species of birds that were dedicated to him, viz.: *Megascops asio bendirei* Brewster, *Loxia curvirostra bendirei* Ridgway, and *Harporhynchus bendirei* Coues, his name will be remembered in other branches of science. Thus, a mammal bears the name *Atophyrax bendirei* Merriam; a fish, *Potamocottus bendirei* Bean, and three fossil trees are *Acer bendirei* Lesquereux, *Rhus bendirei* Lesquereux, and *Marsilea bendirei* Ward. He also first cleared up the life history of the "Red Fish" of Idaho, showing that the supposed little land-locked red salmon *Oncorhynchus kennerlyi* is really the young breeding male or grilse of *Onorhynchus nerka*. (J. C. Merrill, In Memoriam: Charles Emil Bendire, *The Auk*, January, 1898, xv, no. 1, 1-6.)

Major Bendire was in Washington on leave of absence from September 1883 to August of the following year. At this time, at the request of Professor Baird, he assumed charge, as Honorary Curator, of the Department of Oölogy of the United States National Museum, which was in a neglected condition.

Most of the eggs of the North American land birds were stored without order and very many were of more or less doubtful identification, but the latter have since been eliminated from the collection; the eggs of the water birds were in a somewhat more satisfactory condition, and many are still

retained. With his characteristic energy Major Bendire at once went over this material and incorporated with it his private collection of about 8,000 specimens, which he presented to the Museum, and which is the basis of the present collection of about 52,000 specimens, acquired largely by his personal efforts and by the gifts of his friends and correspondents. This collection is the culmination of Major Bendire's life work as an oölogist; its excellent arrangement, the fine condition and careful identification of specimens, and the full series of most species being too well known to need detailed description. . . .

In the first volume of *The Osprey*, of which Surgeon Elliott Coues was an editor, there was a section called "Dr. Coues' Column." The following appeared in the first of these:

Since the deaths of Dr. Brewer, Prof. Baird, and Major Bendire, I am probably the only person living who knows the episode of Bendire's early career that led to the deposit of his egg collection in the U. S. National Museum. I "discovered" Bendire late in 1871, or early in 1872, when he was stationed at Tucson, Ariz., and I was Post Surgeon at Fort McHenry, Baltimore, Md. Some of the earliest, if not the very first results of his field work were published by me in the *American Naturalist* for June, 1872, upon the strength of the correspondence with him upon which I had already entered. Later that year, when I had become Post Surgeon at Fort Randall, S. Dak., he sent me some novelties and rareties in birds and eggs, among the former being those new species which I named *Harporhynchus bendirei* and *Peucæa carpalis*. About that time the bumptious and captious German soldier, who was a man to take strong likes and dislikes on very small provocation, had a falling out with Dr. Brewer and Prof Baird, whose "History of North American Birds" was then well under way. He fancied himself slighted by them, or misused in some way—I have forgotten exactly how. So he poured out his grievances to me in long letters in which he abused them right heartily and swore by "donner and blitzen" that they should never have anything from him. I suppose that Dr. Brewer, who was a narrow-minded, prejudiced, and tactless person, had wounded Bendire's self esteem in some way, and thought I would do what I could to heal the breach, especially as I did not want his eggs. I had no private collection; the Smithsonian always received whatever I collected in those days, and I thought Bendire's eggs ought to go there too. So I determined to tell Prof. Baird about the doughty captain's state of mind, feeling confident that Bairdian suavity, sagacity and tactfulness would easily set matters aright. I did so; and promptly came from Baird an urgent request to see Bendire's letters to me, that he might learn exactly what the trouble was. Knowing that Baird's astuteness could be trusted, and having entire faith in his ability to manipulate men and measures, I sent him the whole of the correspondence. It was a case in which somewhat

questionable means were justified by the desirable results. I never knew exactly how Baird conducted his diplomacy; but he smoothed Bendire's ruffled plumes effectually, soon had him well in hand, and in due course thereafter the Bendire collection was in Baird's hands also, becoming the nucleus of the present unrivaled oölogical cabinet in the National Museum, of which Bendire was honorary curator until his death. The same result would probably have been effected in the course of time without my friendly intervention, for few persons whom Baird ever got hold of escaped him afterward, chiefly for the reason that few ever desired to get away from what he could and would do for them. But the fact remains that I was the one who turned Bendire over to Baird, shortly after my original discovery of him and that this intermediation led directly to the consummation with which all are now familiar. (*The Osprey*, April, 1897, i, no. 8, 113.)

Having rearranged the collection of eggs to his satisfaction and made it available for study while constantly adding to it, he was prepared to undertake a work which he had long had in mind, and which was suggested to him by Professor Baird. This was to be an oölogy of North American birds, but as notes and material gathered by an extensive correspondence and careful search of records were accumulated, it was found advisable to extend the scope of the work which, in its final form, is well described by the title "Life Histories of North American Birds" though this name was not decided upon until much of the first volume was written. In the preparation of this volume, a great deal of material for the succeeding volumes was gathered. . . . The first volume, issued in July, 1892, was greeted with the greatest satisfaction by ornithologists and while it met with scant notice in *The Auk*, foreign journals gave it a most cordial welcome. This was followed in September, 1895, by the second volume, which fully sustained the author's high reputation, and upon these will rest Major Bendire's secure fame as an ornithologist. (Merrill, *loc. cit.*)

Dr. Frank Hall Knowlton of the United States National Museum, in his sketch of Major Bendire, says of the *Life Histories of North American Birds*:

These magnificent volumes will remain as a monument to him and a high mark for the emulation of future workers. It may be high praise to compare these Life Histories with the writings of Audubon, Wilson and Nuttall, but it is freely bestowed, for they are undoubtedly the best written and most readable accounts of the habits of our native birds that have appeared since their time. It is much to be regretted that he was not permitted to finish the work so well begun. The material for the succeeding volumes was accumulating, but little or nothing had been done toward the actual writing. (F. H. Knowlton, *The Osprey*, March, 1897, i, no. 7, 87-90.) [The series is now continued in Bent's *Life Histories of North American Birds*, thirteen volumes to 1940.]

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.

840

LIFE HISTORIES

OF

NORTH AMERICAN BIRDS

WITH SPECIAL REFERENCE TO

THEIR BREEDING HABITS AND EGGS,

WITH

TWELVE LITHOGRAPHIC PLATES.

BY

CHARLES BENDIRE, CAPTAIN, U. S. ARMY (RETIRED),

Honorary Curator of the Department of Oology, U. S. National Museum,
Member of the American Ornithologists' Union.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1892.

FIG. 5.

Title Page of Bendire's Life Histories.

"These magnificient volumes will remain as a monument to Bendire and a high mark for the emulation of future workers"—Dr. Frank Hall Knowlton of the U. S. National Museum.

In his description of the *Life Histories*, Merrill continues:

> Besides the uniform excellence of the work, two points deserve especial mention . . . One is the care exercised in giving the geographical distribution of each form and the extent of its breeding range; these, based upon the latest and most reliable data and the personal identification or reidentification of specimens, are beyond comparison the best ever published. This necessary examination of specimens was most fortunate, for it had much to do with extending the scope of the work as originally planned and gave the author an enviable position as an ornithologist of sound judgment. The second point is the large amount of fresh unpublished material incorporated in the "Life Histories"; much of this is based upon the author's own observations during his long residence in the West supplemented by information derived from his extensive correspondence, the authority and credit for which are carefully given. (Merrill, *loc. cit.*)

J. A. Allen, reviewing Bendire's *Life Histories of North American Birds*, said:

> It treats of 146 species and subspecies, beginning with the Grouse and ending with the Owls, thus including the Gallinaceous Birds, the Pigeons, and the Birds of Prey. This long contemplated work, all things considered, could not have fallen into better hands, or appeared under more favorable auspices. It early interested the late Professor Baird, who for many years cherished the plan of publishing, under the auspices of the Smithsonian Institution, a comprehensive work on this subject. . . . Captain Bendire's method of treatment seems well chosen; the matter, as too often is the case in "egg-books," is not limited to a description of nests and eggs, but includes, as the name implies, the general life histories of the species treated — their geographical distribution, their migrations, their breeding ranges, their nesting habits, and their food. In many cases, in respect to materials, as in the case of well-known species, there is an embarrassment of riches, and the question is what to select and how much is really worthy of reproduction. In many cases, however, it is far otherwise, and the striking feature of Captain Bendire's work is the amount of wholly new material it contains, drawn either from his many years of personal experience in the field, largely in comparatively unknown portions of the Far West, or from the letters of his many correspondents in all parts of the country. Much of the original information has evidently been especially solicited for the present work.
>
> Captain Bendire's style is simple and direct, with no attempt at embellishment or literary effect, but this is more than compensated by the care and thoroughness with which every aspect of the subject is presented. Doubtless there are some deficiencies of detail that might have been remedied, but as a whole the book is eminently satisfactory as a compendium of the subject of which it treats. It is unencumbered with tables of synonomy and biblio-

graphical references, although due credit is given in footnotes to the sources from which previously published information has been drawn. In his official capacity as Curator of the Department of Oölogy in the United States National Museum, recently so greatly enriched by his own unrivalled collection, he has had the fullest access to abundant material which, however, he has been able to supplement when necessary by that of scores of willing collaborators in the same field. The illustrations are on a liberal scale, and in execution are above criticism. It is perhaps safe to say that they are the best egg plates, taking the series as a whole, ever produced, at least in this country, and probably anywhere. (*The Auk*, October, 1892, ix, no. 4, 375-376.)

Bendire was not a voluminous writer, as were some of his brother officers who were ornithologists. His earlier records were mostly in letters to Allen, Baird, Brewer and Coues, of whom presently, who sometimes, beginning about 1872, published them as special notes, or brought them together as a local list. Later he wrote more freely over his own signature, publishing brief records as well as longer articles, as on the breeding habits of *Sphyrapicus*, *Passerella*, *Glaucidium*, and others. His correspondence increased to burdensome proportions before his death, but he looked after it faithfully, not only obtaining good material for his work, but doing much to establish oölogy on a broader and safer basis, and to impress upon the younger collectors the paramount importance of properly preserving specimens. He was one of the founders of the American Ornithologists' Union as were also such Army medical officers as Coues, Mearns, and Shufeldt.

"Above all things," writes Knowlton, "Bendire was a lover of truth. He had no patience with anything that had not the stamp of unquestioned veracity upon it. In his work he never made a statement which had not been verified, so far as within his power, to the minutest particular. Truthfulness was so much a part of his nature that the shadow of its absence in another, received but scant courtesy at his hands."

His sense of duty was so great that he let nothing overshadow it. . . . To those whom he thought deserving he was ever ready with assistance. His familiarity with almost every foot of the Western territory made his knowledge of the greatest value, and it was freely given. . . .

Major Bendire's personal appearance was probably well known to a majority of American ornithologists. He was strikingly a soldier, and his fine physique and erect bearing will be well remembered. He was not, however, a man who made friends easily. He had a reserve manner which amounted at times almost to brusqueness, yet beneath the rough exterior was a warm

and sympathetic heart. To those who were so fortunate as to know him intimately, he was a genial companion, full of reminiscences and anecdotes of his long life on the frontier, of its hardships and dangers, and its scientific successes. But on the approach of a stranger he became silent. (Knowlton, *loc. cit.*)

Bendire's health had become impaired and in an advanced stage of nephritis he left his home in Washington and went to Jacksonville, Florida, where five days later he died, 4 February, 1897. He was buried with military honors in the National Cemetery at Arlington, Virginia. There, too, as will be mentioned, rest a number of the other Army ornithologists of whom we treat.

The following are a few of the ornithological contributions of Captain Bendire: The Cowbirds, *U. S. National Museum Report*, 1893; Directions for Collecting, Preparing and Preserving Birds and Their Eggs and Nests, *U. S. National Museum Bulletin* No. 39, Part D, 1891; Life Histories of North American Birds, from the Parrots to the Grackles, with Special Reference to their Breeding Habits, *Smithsonian Institution Publications* 840 and 985 Washington, 1892-1893. In Clarence Moore Weed's *Bird Life Stories*, two volumes, 1904, there are included nine of Bendire's bird biographies. In Bendire's writings, there are frequent references to Merrill, Coues, Cooper, Mearns, and Shufeldt, other Army ornithologists whose work will be outlined below.

Here are a few examples of Captain Bendire's bird biographies:

The Blue Jay, one of our best-known birds, is a resident and breeds throughout the greater portion of its range, but is usually only a summer visitor in the northern parts of the United States and southern Canada. . . . Few of our native birds compare in beauty of plumage and general bearing with the Blue Jay. While one cannot help admiring him on account of his amusing and interesting traits, still even his best friends cannot say much in his favor, and though I have never caught one actually in mischief, so many close observers have done so that one cannot very well, even if so inclined, disprove the principal charge brought against this handsome freebooter. He is accused of destroying many of the eggs and young of our smaller birds, and this is so universally admitted that there can be no doubt of its truth.

However, notwithstanding all his vices, I cannot help admiring our Blue Jay, for he has good traits as well. Cunning, inquisitive, an admirable mimic, full of mischief—in some localities extremely shy, in others exactly the reverse—it is difficult to paint him in his true colors. Not a few writers call him a

bully and a coward, and perhaps he deserves these names at times, but instances are not lacking which show that he possesses courage in the defense of his young; it is a devoted parent, and will sometimes attack man himself in protecting his nestlings. But it is unfortunate that he shows so little consideration for the feelings of other birds when he despoils them of their young. . . .

While ordinarily a noisy bird, the careful listener may occasionally be treated to quite a pleasing effect at singing or warbling. Its remarkable powers of mimicry have often been commented on, and it is astonishing how accurately the Blue Jay is able to imitate the various calls, alarm notes, and cries of distress of other birds, and of many mammals as well. These will readily deceive anyone, and the Blue Jay seems to delight in playing tricks on its unsuspecting neighbors in this manner, apparently out of pure mischief. They are especially fond of teasing owls, and occasionally hawks also, but sometimes with disastrous results to themselves. While in the woods they are comparatively safe; but if one ventures into the open, and the hawk should get tired of its tormentor and turn on him, the consequences are usually serious for the Blue Jay. His flight is laborious and accomplished only with a good deal of flapping of the wings. He is no match for our smaller hawks; and even a Kingbird never fails to attack a Blue Jay most vigorously, should it chance to catch one while flying from one wood to another, or to come near the Kingbird's nest. The Blue Jay knows this, and stays therefore as much as possible in the timber. . . .

Throughout the greater part of the year the Blue Jay is a more or less restless, noisy, and roving bird, moving in little companies from one wood to another. During the nesting season it becomes more quiet and retiring, and is less often seen or heard. It prefers mixed woods to live in, especially oak and beech woods, but for nesting sites dense coniferous thickets are generally preferred. . . . The nests are placed in various situations, sometimes in a crotch or close to the main trunk, or on the extremity of a horizontal limb among the outer branches. They are placed at distances from the ground varying from five to fifty feet, but usually below twenty feet. . . . I believe but one brood is reared in a season, but in the South they may occasionally raise two. . . . The number of eggs to a set varies from three to six. . . . Both sexes assist in incubation, which lasts fifteen or sixteen days. . . . (*Life Histories of North American Birds*, ii, 356-361; quoted by C. M. Weed, *Bird Life Stories*, i, 31-35.)

The Nighthawk is generally a common resident throughout the eastern United States north of latitude 35°, while south of this it is more irregularly distributed, but nests, to some extent at least, in all of our Southern states excepting perhaps Florida and the immediate vicinity of the Gulf Coast. Its common name is somewhat of a misnomer; it is by no means nocturnal in its habits. In fact, it is diurnal and crepuscular, and it is not at all unusual to see numbers of these birds on the wing on bright sunny days; but it does

most of its hunting in cloudy weather and in the early mornings and evenings, retiring to rest soon after it becomes dark. During bright moonlight nights, however, it keeps up its flight somewhat later, and I have heard its calls as late as eleven o'clock.

It is one of our most graceful birds on the wing and its aërial evolutions are truly wonderful. One moment it may be seen soaring through space without any apparent movement of its pinions, and again its flight is accompanied by a good deal of rapid flapping of the wings, like that of our falcons, and this is constantly more or less varied by numerous twistings and turnings. While suddenly darting here and there in pursuit of its prey, I have seen one of these birds shoot almost perpendicularly upward, with the swiftness of an arrow, in pursuit of some insect. Its tail appears to assist it greatly in these sudden zigzag changes, being partly expanded during most of its complicated movements. I know of no more interesting sight than to watch a number of Nighthawks while engaged in feeding, skimming close to the ground along in all kinds of serpentine gyrations with the utmost grace and ease.

The Nighthawk is a social bird while on the wing; I have seen fully a hundred at one time hawking over a small mountain meadow or a pond, and they certainly seemed to enjoy each other's company. While on the wing, their querulous and squeaky call-note, sounding like *aeh-eek*, *aek-eek* or *speek-speek*, is repeated at different intervals. When disturbed while sitting on its eggs, it usually utters a low, purring or chuckling sound; and during early spring the male frequently descends rapidly from high above, the vibration caused by the air passing through the primaries producing a peculiar booming sound which has been compared to that made by blowing through the bunghole of an empty barrel.

It is amazing to see what perfect control these birds have over themselves during this peculiar performance. Descending as they do almost with the rapidity of a lightning flash, one would think they could not possibly arrest their downward course in time to prevent being dashed to the ground; but at the proper moment, by a single reverse movement of their wings, they rise in a gradual curve, to resume their flight, or repeat the same performance. On the ground, however, the Nighthawk does not show to such good advantage, and its movements here are slow, unsteady, and evidently more or less laborious.

The food consists mainly of insects, such as flies and mosquitoes, small beetles, grasshoppers, crickets, and the smaller night-flying moths, all of which, I believe, are caught on the wing. It must be considered an eminently useful and beneficial bird and deserves the fullest protection. Its favorite haunts are the edges of forests and clearings, burnt tracts, meadow lands along river bottoms, and cultivated fields, as well as the flat mansard roofs in many of our larger cities. During the heat of the day the Nighthawk may be found resting upon horizontal limbs of trees, on fence rails, the flat surface of some lichen-covered rock, on stone walls, chimney tops, and on railroad

FIG. 6.

CHARLES EMIL BENDIRE.
(1836-1897)
Brevet Major, United States Army.
(From the Photographic Collection of the Smithsonian Institution)

tracks. When perched on the limb of a tree, a log, or a fence rail, it always sits lengthwise, and excepting during the nesting season, I have rarely seen one on the ground. . . .

Like the rest of its family, the Nighthawk makes no nest, but deposits its two eggs on the bare ground, frequently in very exposed situations, sometimes on some little elevation, or in slight depressions on flat rocks, between the rows in corn or potato fields, in pastures, on gravel bars, and cinder piles near furnaces. Within recent years they also nest more and more frequently on the flat, gravel-covered roofs of houses in our larger cities. They undoubtedly find such nesting sites very convenient and secure, but the intense heat to which the eggs and young are necessarily exposed during the day must be something fearful, and I have no doubt that some of the latter perish, and that not a few of the eggs become addled from this cause. (*Life Histories of North American Birds*, ii, 163-167; quoted by C. M. Weed, *Bird Life Stories*, ii, 60-63.)

The Hairy Woodpecker is fairly common through the wooded regions of our northern and middle states, and in winter is occasionally found in some of the southern states—Louisiana, for instance. It is a resident in the mountainous regions of North Carolina, while in the lowlands it is replaced by a smaller southern race. It is a hardy bird, and intense cold does not appear to affect it much.

As a rule the Hairy Woodpecker is rather unsocial, and unless followed by their young, more than a pair are rarely seen together. It does not live in harmony with smaller species of its own kind, and drives them away when they encroach on its feeding grounds, being exceedingly greedy in disposition and always hungry. It is partial to timbered river bottoms, the outskirts of forests and occasionally it makes its home in old orchards and in rather open, cultivated country, interspersed here and there with isolated clumps of trees. It is also found in the midst of extended forest regions.

The Hairy Woodpecker, like most of its relatives, is an exceedingly beneficial and useful bird, which rids our orchards and forests of innumerable injurious larvæ, like those of the boring beetles, which burrow in the wood and between the bark and trunk of trees. It never attacks a sound tree. Although commonly known as *Sapsucker*, this name is very inappropriate. It is not in search of sap, but of such grubs as are found only in decaying wood. Nevertheless it is exceedingly difficult to make the average farmer believe this, and in winter when these birds are more often seen about the vicinity of dwellings and the neighborhood of orchards than at any other season of the year, many are shot under the erroneous belief that they injure the very trees they are doing their best to protect.

The food of this bird, besides larvæ, consists of various species of small beetles, spiders, flies, ants, and in winter when such food is scarce, to some extent of seeds and grain, and less often of nuts and acorns. I have seen it cling to fresh hides hung up to dry, picking off small particles of fat and

meat, and in summer it occasionally eats a few berries of different kinds. In the fall of the year it can often be seen inspecting old fence posts and telegraph poles, probably on the lookout for cocoons, spider eggs, etc.

Like all the Woodpeckers, it is an expert climber, and moves rapidly up and around trees in short hops. It is equally easy for it to go backward or sidewise, and it is astonishing how rapidly it can move in any direction. The strong feet and sharp claws enable it to hold firmly to the bark, and the stiff spiny tail feathers also come into play while it is at work, acting as a support for the body, which is well thrown back when a blow is delivered with its powerful chisel-like bill.

Although usually shy, when busily in search of food one will occasionally allow itself to be very closely approached. I have seen one alight on the trunk of a crabapple tree within three feet of me and deliberately commence searching for larvæ, apparently perfectly unconcerned about my presence, and when I moved up a little closer he simply hopped around on the opposite side of the tree and continued his search. Every once in a while, however, his head would appear from behind the tree to see if I were still watching him. He remained fully thirty minutes on the same tree, where he evidently found an abundance of food, and then flew off uttering several loud notes like *huip, huip*. His ordinary call sounds like *triii, triii*, a shrill rattling note. . . .

Their sense of hearing must be exceedingly acute, as they appear to detect readily the slightest movement of any insect under the bark or in the solid wood, and they make no mistake in properly locating it. Their flight is rapid, undulating, usually not very protracted, and they rarely descend to the ground in search of food, where their movements are rather awkward and clumsy.

Nidification usually begins early in April, and it requires about a week to prepare the nesting site. Both sexes take part in this labor, and it is really wonderful to see how neat and smooth an excavation these birds can make with their chisel-shaped bills in a comparatively short time. The entrance hole is as round as if made with an auger, about two inches in diameter, and just large enough to admit the body of the bird; the edges are nicely beveled, the inside is equally smooth, and the cavity is gradually enlarged toward the bottom. The entrance hole, which is not infrequently placed under a limb for protection from the weather, generally runs in straight through the solid wood for about three inches and then downward from ten to eighteen inches, and some of the finer chips are allowed to remain in the bottom of the cavity in which the eggs are deposited.

After this is completed, the male frequently excavates another hole, or even several in the same tree, or in another close by, in which to pass the night or seek shelter, and to be close to the nest while the female is incubating. These holes are not as deep as the others. . . .

The duties of incubation are divided between the sexes and last about two weeks. The young when first hatched are repulsive looking creatures, blind and naked, with enormously large heads and ugly protuberances at the base

of the bill, resembling a reptile more than a bird. They are fed by the parents by regurgitation of their food, which is the usual way in which the young of most Woodpeckers are fed when first hatched. The young remain in the nest about three weeks. Even after leaving the nest they are assiduously cared for by both parents for several weeks until able to provide for themselves. (*Life Histories of North American Birds*, ii, 46-50; quoted by C. M. Weed, *Bird Life Stories*, i, 64-67.)

The following birds have been named in honor of Bendire:

Little Screech Owl, *Otus asio bendirei* (Brewster)
Bendire's Thrasher, *Toxostoma bendirei* (Coues)
Bendire's Crossbill, *Loxia curvirostra bendirei* Ridgway
Bendire's Pigeon Hawk, *Falco columbarius bendirei* Swann

Bendire himself described and named:

Attwater's Prairie Chicken, *Tympanuchus cupido attwateri* Bendire

(List furnished by Dr. Theodore S. Palmer)

PRINCIPAL BIOGRAPHIC SOURCES

1. C. Hart Merriam, *Science*, 12 February, 1897, n. s. v, no. 111, 261-262. Reprinted in *The Oölogist*, Albion, N. Y., April, 1897, xiv, no. 4, 37.
2. F. H. Knowlton, Major Charles E. Bendire, *The Osprey*, Galesburg, Ill., March, 1897, i, no. 7, 87-90.
3. *The Oölogist*, March-April, 1897, xiv, no. 3, 36.
4. James C. Merrill, In Memoriam: Charles Emil Bendire, *The Auk*, January, 1898, xv, no. 1, 1-6.
5. *Report of the Secretary of the Smithsonian Institution for 1897*, Washington, 1898, 19, 30.
6. Wm. H. Powell, Records of Living Officers of the United States Army, 53-54.

JAMES GRAHAM COOPER (1830-1902)

Acting Assistant Surgeon, United States Army

Though Dr. James Graham Cooper was not an officer of the Regular Army, it has been thought proper to consider him here because of his long service to the Federal Government as a contract surgeon and naturalist, doing his work under the supervision of the

future Major-General George Brinton McClellan of the Corps of Engineers, United States Army

He was a distinguished naturalist and the son of a distinguished naturalist, though the name of his father is omitted from the chief records of American biography. The Dictionary of American Biography disregards him, while including the son.

The elder Cooper was William, born in 1798 of a New York family of English origin. He inherited, it is said, his love of nature from his mother, Frances Graham, and determined to devote himself to the study of natural history. At the age of eighteen he became one of the founders of the Lyceum of Natural History, now the New York Academy of Sciences, under the lead of Dr. S. L. Mitchell, John Torrey, Daniel Barnes, and others. He soon became a generous contributor to its library and one of its officers. In 1812 William Cooper sailed for Europe to continue his studies in zoölogy and was elected the first American member of the Zoölogical Society of London. He attended the lectures of Cuvier in Paris, and on his return to the United States devoted himself to ornithology and paleontology. He was a friend of Schoolcraft, a correspondent and collaborator of Charles Lucien Bonaparte, who dedicated to him the well known *Falco cooperi*, the type specimen of which was shot by William Cooper in Hudson County, New York. Another type specimen, *Actodromas cooperi* was also taken by him. It is hardly surprising that the son of such a father became himself interested and skilled in ornithology. (W. H. Dall, Obituary of J. G. Cooper, *Science*, 15 August, 1902, xvi, no. 398, 268).

James Graham Cooper, the future military surgeon and ornithologist, was born in New York City, on 19 June 1830, the eldest of six children. When a boy of seven, his family removed to the vicinity of Hoboken, New Jersey. The youth had his first experience in the study of natural history when he learned carefully to observe bird life around him. His father, of course, encouraged his tastes and aided him from his own generous store of knowledge, as well as that derived directly or indirectly from his friends, the ornithologists, Thomas Nuttall, John James Audubon, John Torrey, the botanist, and Henry Schoolcraft, the historian.

In his autobiographical summary, Cooper wrote:

I was noted for planting toothpicks to raise geese, and for huggling goslings to death, a budding of ornithological tastes. This occurred in 1837 and continued say, to 1840. I went to a country school in summer, walked a mile over hills and bad roads, taking side paths through the fields to hunt bird nests, shells and reptiles, which I preserved till some naturalist captured the specimens for little or nothing. The most noted of these captures was a living copperhead snake which my sister Mary and I found while crossing a newly cleared field, and which finally went alive to England. I had many hunts for quadrupeds and preserved some up to the size of gray and fox squirrels, besides keeping red and flying squirrels, a raccoon, opossum, and other animals as pets, which attracted much interest among visitors. I had a boy's mania for hunting, and although I could only get small animals and birds, I spent many a day in shooting, no doubt with impoverishment to physical health. I would wade through snow knee deep for miles with poor results as to game, but thought if I ever went into a wild country, the hunter's life would be my choice. Why men could not live happily on the natural products of the forests and streams was a problem I expected to solve in the future. About this time Tanner's "Thirty Years Among the Indians of Canada" showed me much of the difficulties in the way of such a mode of existence. (W. O. Emerson, In Memoriam. Dr. James G. Cooper, *The Condor*, September-October, 1902, iv, no. 5, 101-103.)

In 1851 the younger Cooper graduated from the College of Physicians of New York, and spent the two ensuing years in practical work in the hospitals of the metropolis. His active work as a field naturalist began in 1853 when he entered into a contract with Governor Isaac Ingalls Stevens (1818-1862), of Washington Territory, to serve as one of the surgeons of the Pacific Railroad Survey Expedition. His pay was to be seventy dollars per month. This work he undertook at the advice of Professor Spencer Fullerton Baird, then Assistant Secretary of the Smithsonian Institution, a friend of his father's. Before leaving for the West, he spent some time at the Smithsonian Institution preparing himself for the work of a naturalist, as this was understood to be a part of his duties in addition to those of a surgeon. While in Washington he was one of the group of young naturalists who gathered about Professor Baird in the early days of the Institution, who made up the Megatherium Club. Their names are classic in the annals of zoölogy in this country. Although never robust, Cooper survived nearly all of the others.

The function of the expedition which Cooper joined was a

two years exploration of the route along the forty-seventh and forty-ninth parallels. He was assigned to the western division of the Survey, terminating at Puget Sound, under the superintendence of First Lieutenant and Brevet Captain George Brinton McClellan of the Corps of Engineers, United States Army, destined to rise to the grade of Major-General and to command the Union Army. The Honorable Jefferson Davis, former Army officer and West Point graduate, was then Secretary of War, while the regimental quartermaster who supplied the needs of the party on the Pacific Coast was Captain Ulysses Simpson Grant. Lieutenant Andrew Jackson Donelson, Jr., was in command of the escort. Colonel William Joseph Hardee, later Lieutenant-General, C. S. A., was in command of the Division of the Pacific.

The collaborators with Cooper in working up the collections made by the Survey were a distinguished group indeed, including Baird, Torrey, Asa Gray, Ferdinand Vandiveer Hayden, George Gibbs, Fielding Bradford Meek, John Lawrence LeConte, and Surgeon George Suckley, of whom presently. It was Surgeon Suckley who with Cooper prepared the report on the birds of Washington Territory.

As usual in those days, a naturalist had to devote himself to all branches, so that Cooper not only made collections of fauna and flora, but also made a particular study of the meteorology of the region. Meteorological observations were then, as for many years earlier and many years later, required of medical officers (*cf.* E. E. Hume, *Bulletin of the History of Medicine*, February, 1940, viii, no. 2, 202-238).

The Survey was disbanded 1 April, 1854 and McClellan ordered Cooper to report to Governor Stevens at Fort Vancouver. At the end of the work in the field, Cooper returned to Washington to prepare his report, but was soon obliged by pulmonary disease to return to the more favorable climate of the Pacific Coast. For several years thereafter he devoted himself to making ornithological collections on the Pacific Coast, much of the time at his private expense, for he had inherited a competence from his father.

In 1855, Cooper made a voyage to the Straits of Fuca and spent a month on Whitby Island, collecting specimens, returning in the

following July. On 4 October, 1856, he sailed on the Coast Survey steamer *Active* to San Francisco, and spent six weeks collecting specimens in the Santa Clara Valley. He then proceeded southward to Panama, collecting shells for his father, whose last scientific writing was a report on West Coast shells.

On 22 April 1857, the Secretary of the Interior appointed Doctor Cooper Surgeon to the Wagon Road Expedition from Fort Kearney to the South Pass and Honey Lake. However, when the expedition reached the Rocky Mountains it became necessary to disband it and the Doctor went on a collecting trip through the Mojave Desert. The results of this trip are contained in his various reports on the fauna of Montana, Wyoming and the Mojave, and are scattered through his later writings.

On 16 April, 1860, General Winfield Scott issued Special Order No. 47, directing Dr. J. G. Cooper, Contract Surgeon, to report at New York and to proceed thence to Fort Columbus, Department of Oregon, accompanying a detachment of recruits. This duty terminated on 19 October 1860, but Cooper's contract was continued to the end of that year.

Thereafter we find him collecting along the coast from San Francisco to San Diego. Thenceforth his energetic scientific mind was continuously occupied with field observations and other studies the results of which fill his publications until the year 1890. (W. O. Emerson, *Bulletin of the Cooper Ornithological Club*, January-February, 1899, i. no. 1, 1-5).

With the outbreak of the War Between the States, Cooper volunteered his service and was commissioned by Governor Law on 24 May, 1864, Assistant Surgeon of the Second Cavalry, California Volunteers. In this capacity he served through the campaign and was mustered out after the close. The photograph here reproduced was taken while he was in the field during the war. Even amid the stress of war, Assistant Surgeon Cooper did not relinquish his scientific work, which was that of identification of individual specimens, of reference, and in publishing his observations. He was a systematist and not merely a collector.

From 1865 to 1866 he was naturalist to the Geological Survey of California, under Josiah Dwight Whitney. His report on the birds

of the State after the close of the Survey, was edited by Professor Baird and published by Professor Whitney at his personal expense, though in the form of one of the *Reports of the State Geological Survey*. (See illustration of title page, Figure 8.)

On 9 January, 1866, he was married to Rosa M. Wells at Oakland, California, and during that year established himself in the practice of medicine at Santa Cruz, California. His health had become so impaired that in 1871 he was forced to give up the practice of medicine, though his ornithological work continued when he was physically able to work. Naturally, there were many interruptions. He spent his declining years at Hayward, in the vicinity of Oakland, California, where he died 19 July, 1902.

He was long associated with the California Academy of Sciences, and with the State Mining Bureau. The Cooper Ornithological Club of California (organized 22 June, 1893) was named in his honor, and the first number of its *Bulletin*, now known as *The Condor*, contains a sketch of his life up to 1899, and a portrait. (*Bulletin of The Cooper Ornithological Club*, January-February, 1899, i, no. 1, 1-5).

The writing of his reports brought him into correspondence with Doctor Coues, of whom presently, and other ornithologists. In a letter dated Fort Macon, North Carolina, from Surgeon Elliott Coues, U. S. Army, to Doctor Cooper, there is this paragraph:

> My large work still remains in MSS; but is about ready for the press. I have about 2500 pages of MSS. Yours and mine together will, I think, about use up the subject. Yours has the great desideratum of mine—illustrations. I know that they will be *great*; have seen the proofs of a great many of them, and they are first rate. Best things out since Cassin's and the Pac. R. R. Reports!! I deeply regret that my book can boast of nothing of the sort, but I have no means of procuring any such desirable embellishments. . . . (*The Condor*, September-October, 1902, iv, no. 5, 106-107.)

Professor Baird characterized Cooper's work, published in conjunction with the Geological Survey of California, as "by far the most valuable contribution to the biography of American birds that has appeared since the time of Audubon." (S. F. Baird, T. M. Brewer, and R. Ridgway, *History of North American Birds*, 1874, Preface, v). Coues referred to Cooper as "so well known as an

Fig. 7.

JAMES GRAHAM COOPER.
(1830-1902)
Acting Assistant Surgeon, United States Army.
Photograph made in 1865.
(Collection of the Cooper Ornithological Club)

indefatigable and accurate naturalist." The authoritative chapter upon zoölogy in T. F. Cronise's *Natural Wealth of California* (1868) is by James Graham Cooper, as acknowledged in the preface of the book.

Much of his early work was of great help and importance in developing knowledge of the fauna, flora and geology of the Pacific Coast. His most important contributions to natural history were in ornithology. Later he published many papers on the mollusks of the coast and the number of titles in this field of research alone is forty-three. "A pioneer collector of scientific materials and writer on the natural history of California and Washington, Cooper left his impress for all time on the records of these Western states, by setting down painstakingly the facts of geographic distribution in the days when original conditions were untrammeled." (J. Grinnell, *Dict. Amer. Biogr.*, iv, 406-407).

Cooper is described as "tall and slender, rather reserved in manner, and his physical activity was held in check by ill health during much of his life, while for years he was dependent upon his medical practice for support. But in spite of these handicaps his work on the Pacific Coast has been of primary importance." (W. H. Dall, *loc. cit.*).

The Ornithological Writings of Dr. J. G. Cooper, published by Joseph Grinnell in *The Condor*, September, 1902, iv, no. 5, 103-105, lists all his twenty-six ornithological papers, the majority printed between 1860 and 1880. Grinnell says:

> While the number of Cooper's titles was not great, his articles thus appeared at a time when much less was written on birds than now, and when much of the subject-matter we might now regard as commonplace was new information altogether. . . . All but two of his publications pertained at least in part to the birds of California. Aside from his signed articles, Cooper furnished material, in the way of specimens and manuscript notes, which was used by Baird in 1858 and 1864, and especially by Baird, Brewer and Ridgway in their colossal "History of North American Birds," 1874 and 1884.

The following are the titles of the articles, the full reference being available in *The Condor*, *loc. cit.*: (1) Report on the Land Birds collected on the Survey of Washington Territory, 1853-1855. This was Cooper's first published article on ornithology, and pertains chiefly to the birds noted during the survey of Oregon and Washing-

ton. (2) New Californian Animals. (3) On a new Cormorant from the Farallone Islands, California. (4) Some Recent Additions to the Fauna of California. (5) The Fauna of Montana Territory. (6) The Naturalist in California. (7) Notes on the Fauna of the Upper Missouri. (8) "Geological Survey of California. J. D. Whitney, State Geologist: Ornithology. Volume I, Land Birds, Edited by S. F. Baird, from the Manuscript and Notes of J. G. Cooper. Published by the authority of the Legislature, 1870, pp. i-ix, 1-592; with a great many figures." This is Cooper's greatest work. It includes the birds of all the region west of the Rocky Mountains. Most of the text is in the nature of biographical accounts, and included most of what was known at the time of publication. (9) The Fauna of California and its Geographical Distribution. (10) Monterey in the Dry Season. (11) Animal Life in the Cuyamaca Mountains. (12) "Verbal Remarks." (13) Notes on Californian Thrushes. (14) New Facts Relating to Californian Ornithology. (15) Early Nesting of the Anna Humming-bird. (16) California Garden Birds. In this work Cooper names and characterizes a western race of the Tree Swallow *Hirundo bicolor* var. *vespertina*. This is the only "variety" or subspecies Cooper ever named, for as shown by most of his writings he did not lean strongly toward trinomialism. (17) Nesting Habits of the Californian House Wren. (18) On seventy-five Doubtful West coast Birds. (19) Californian Prairie Chickens. (20) On the Migration and Nesting Habits of West Coast Birds. (21) The Water Birds of North America—A Few Corrections. (22) The Water Birds of North America—Explanations. (23) Additions to the Birds of Ventura County, California. (24) Note on Pacific Coast Birds. (25) A Doomed Bird. (26) Unusual Nesting Place of *Empidonax hammondi*.

W. P. Taylor published in the *Proceedings of the California Academy of Sciences*, 12 July, 1919 (ix, no. 3, 69-121), *Notes on Mammals collected principally in Washington and California between the years 1853 and 1874 by Dr. Jas. Graham Cooper*.

The following are extracts from Cooper's *Ornithology of California*. The complete bird biographies are not quoted but only a few passages to illustrate his writing.

The *Robin, Turdus migratorius* Linnæus.

The nest of the Robin is built at various heights on trees, and sometimes, as if relying fully on the nobler traits of humanity, in a shed, stable, or even in a saw-mill, close to the constantly working and noisy machinery. I have found one in the cleft of a split tree which had been broken down by the wind. . . . The Robins song is loud and sweet, but not much varied. Though usually uttered in spring, it occasionally is heard during other seasons, especially in fine weather, when the musician, having fed heartily in the garden or field, mounts to the top of a tree, and returns thanks for human hospitality in the most pleasing melody.

Their food consists chiefly of insects, especially worms, for which they hop over grassy fields in the spring, watching and listening for the gnawing grub or earthworms, driven to the surface by rain, occasionally seizing one with a quick motion of the head, swallowing it whole, or picking it to pieces. They also feed much on berries, especially during winter, when they eat those of the Madrona (*Arbutus*), and even the bitter fruit of the dogwood (*Cornus*). Kept in cages they become very familiar, and learn to imitate various tunes and noises. They live sometimes for many years in captivity, and have been made so domestic as to be allowed the free range of the house and surrounding grounds. (pp. 8-9)

The *American Raven, Corvus carnivorus* Bartram.

The American Raven is found in pairs everywhere in California and the adjacent regions, being much more numerous than in the Atlantic States, where few are seen south of the Great Lakes. They frequent, as if by preference, even the most barren desert districts, but are also common near cultivated regions. Being omnivorous, and capable of enduring long fasts, they take advantage of the very barrenness and scarcity of water in the deserts, so destructive to many animals, and watch for their death, in order to support their own life by eating them. They follow trains and herds of cattle, hoping to pick up a dying straggler, and are sure to visit every deserted camp as soon as the occupants move off. When nothing better is to be had they eat lizards, snakes, birds eggs, and in fact everything of an animal nature, however far gone to decay. They also occasionally devour grain, potatoes, etc. but do little damage in that way. They will, however, destroy young chickens, and it is said young fawns, lambs, etc., if they find them unprotected. At times they soar like hawks to a great height, especially before storms, but also when looking out for food. . . . (p. 283)

The *Paisano* or *Road Runner, Geococcyx californianus* Lesson.

This remarkable bird is abundant in the southern part of the State, and follows the valleys northward nearly to the head of the Sacramento, being resident everywhere south of San Francisco. . . . The food consists of insects, lizards and snakes, probably also of any small or young animal it can destroy. It is said to hedge in the rattlesnake with a circle of cactus-joints, until the

reptile, becoming enraged, bites itself and falls an easy prey to the bird. This I have never seen, nor can I understand how such a hard-shelled reptile could be enclosed by even a spiny hedge so as to be unable to escape. It is, however, undoubtedly true that the bird kills these and other snakes also. Its fleetness on foot, when in an open plain, is well known, a fast horse being scarcely able to overtake it. On such occasions it never flies, unless downwards from a height, and its wings seem scarcely ever of much use to it, as it probably cannot fly upwards at all. . . . When tamed it catches mice with great avidity. In Texas, the practice of keeping the animal tamed is quite general, the object being apparently to have them in readiness in case of sickness, for some forms of which their flesh is considered a perfect cure. One of them in Mr. Dresser's possession became very familiar and mischievous, stealing and hiding anything it could carry off, and being particularly fond of tearing up letters and spilling the ink. It was not confined in any way, and frequently visited the neighbors, always, however, returning before evening. . . . (pp. 369-370)

The *White-headed Eagle, Haliætus leucocephalus* Linnæus.

This species, adopted as the bird of America, is much less noble in its disposition than the golden eagle. It lives a great part on squirrels, rabbits, wounded birds, and fish stolen from the industrious fish-hawk, rarely venturing to attack large birds or quadrupeds, and having less strength of wing or swiftness than is required for it to catch many large birds.* It is a very

---

* Cooper's poor opinion of the Bald Eagle as our national emblem is similar to that expressed by Dr. Benjamin Franklin in a letter to his daughter, Mrs. Sarah Bache, dated Passy, France, 26 January, 1784. Franklin, then Minister to France, told of certain criticisms of the newly instituted Order of the Cincinnati, some of which were directed to their badge, the Eagle, designed by Major L'Enfant, who a few years later planned the city of Washington.

"Others object to the *bald eagle* as looking too much like a *dindon* or turkey. For my own part, I wish the bald eagle had not been choosen as the representative of our country; he is a bird of bad moral character; he does not get his living honestly; for you may have seen him pearched on some dead tree, where, too lazy to fish for himself, he watches the labor of the fishing-hawk; and, when that diligent bird has at length taken a fish, and is bearing it to his nest for the support of his mate and young ones, the bald eagle pursues him and takes it from him. With all this injustice he is never in good case; but, like those among men who live by sharping and robbing, being generally poor, and very often lousy. Besides, he is a rank coward; the little king-bird, not bigger than a sparrow, attacks him boldly and drives him out of the district. He is therefore by no means a proper emblem for the brave and honest Cincinnati of America, who have driven all the *king-birds* from our country; . . . . I am, on this account, not displeased that the figure is now known as a bald eagle, but looks more like a turkey. For in truth, the turkey is in comparison a much more respectable bird, and withal a true original native of America. Eagles have been found in all countries, but the turkey was

GEOLOGICAL SURVEY OF CALIFORNIA.

J. D. WHITNEY, State Geologist.

ORNITHOLOGY.

VOLUME I.

LAND BIRDS.

EDITED BY S. F. BAIRD,

FROM THE MANUSCRIPT AND NOTES OF

J. G. COOPER.

PUBLISHED BY AUTHORITY OF THE LEGISLATURE.
1870.

Fig. 8.

Title Page of Cooper's Ornithology of California.

"This is by far the most valuable contribution to the biographies of North American birds that has appeared since the time of Audubon."—Baird, Brewer and Ridgway's "A History of North American Birds," 1875, Introduction.

abundant species where not exterminated by the foolish ambition to "kill an eagle" which inspires most gunners. It is, in fact, so tame around many of the Spanish ranches that it is far easier to kill than the quail or more legitimate game. The Spanish inhabitants rather encourage its presence on account of the great number of squirrels it kills, and I have been told of instances where young ones raised from the nest have been kept for several years in a domestic state, going out daily to kill squirrels, and returning to the house at night. . . .

The manner in which they rob the fish-hawk after its successful plunge and laborious ascent into the air is well known and may be observed in many places where both birds are found, especially along the seacoast. I have not, however, found this habit universal, as both species seem to live in harmony about the islands of the southern coast. . . . (p. 452)

The *Fish-hawk, Pandion carolinensis* Gmelin.

The fish-hawk is found wherever there is clear water containing fish, and, unlike the white-headed eagle, works for its living, occasionally also providing for that dishonest bird. It may be seen about its resorts, especially along the seacoast, sailing round in circles high in the air, watching for hours until it sees a fish in a suitable position, when plunging perpendicularly beneath the water, it seizes its prey in its strong, rough-soled talons, and flies off to some convenient perch to feed. It thus obtains abundance of food, and can rest for hours, or amuse itself in carrying materials to its nest, which it does at all seasons, and without apparent reason. . . . (p. 455)

Cooper's Tanager, Pyranga cooperi Ridgway.

This species, dedicated by Mr. Robert Ridgway to Dr. J. G. Cooper, in an analytical monograph of the red *Pyrangas*, may be readily distinguished from *P. æstiva* upon slight comparison. The size is much larger, the bill especially so. The colors also differ very materially from those of *æstiva*; the red of the head above being scarcely different from that of the throat, instead of being purplish-dusky like the back, as in *æstiva*. . . .

This beautiful bird I found quite common, after April 25, 1861, at Fort Mojave, Colorado Valley, lat. 35°. There they frequented chiefly the tall cottonwoods, feeding on insects, and occasionally flying down to the *Larrea* bushes after a kind of bee found on them. Dr. Coues obtained the same species at Los Piños in New Mexico, and it has also been found at Mazatlan and Colima.

---

peculiar to ours; the first of the species seen in Europe being brought to France by the Jesuits from Canada, and served up at the wedding table of Charles the Ninth. He is, besides (though a little vain and silly, it is true, but not the worse emblem for that), a bird of courage, and would not hesitate to attack a grenadier of the British Guards, who should presume to invade his farmyard, with a *red* coat on." (John Bigelow, *Works of Benjamin Franklin*, viii, 444-445).

They have a call-note, sounding like "Ke-dik" which singularly enough means, in the language of the Mojave natives, "Come here." They also sing in a loud clear tone, and a style much like that of the robin, but with the faculty of making the sound appear very far distant, which is a protection to birds of such bright plumage. (p. 143)

The following are a few excerpts from Cooper's chapter on Land Birds in Cooper and Suckley's *Natural History of Washington Territory* (see biography of Assistant Surgeon Suckley for full account of this important book).

Lewis' Woodpecker, Melanerpes torquatus Bonaparte.

The "collared" woodpecker, called also "Lewis'," in honor of the indefatigable explorer of the northwest, is one of the most beautiful of all the species, and perhaps, of all, the least like a woodpecker in its habits. It is abundant during summer in all the interior districts never approaching the cooler coast, where few of the trees grow which it prefers to inhabit. It arrives in Puget Sound early in May, and some remain during mild winters in the Territory, though in the very cold winter of 1853-1854 some remained at Vancouver. It seems to enjoy the hottest weather, and at mid-day may often be seen perched on a dry limb, from which it will sail off in pursuit of insects, and return, circling and flapping, to its perch. It also sometimes glides down to the ground after grasshoppers, and searches carefully among the branches and leaves for insects, disdaining to toil for its food like its laborious relatives, at least during summer. In winter it is probably compelled to work, after its favorite autumn food of berries is gone, but at other times it rarely ever raps on trees. So little do its habits resemble those of the genus, that Nuttall compares the blackish flock of young in fall to the English jackdaw. It, however, burrows holes for its nest, at all heights from the ground, commonly in a dead tree. Its brilliant and soft plumage resembles more that of some tropical bird than the plain woodpeckers which are its companions in this northern climate. As it wheels and flutters slowly around the trees, the brilliant metallic green and rich carmine flesh in the sun like the fiery tints of the hummingbird. Its flight is always very different from that of other woodpeckers. Besides that above described, it has a traveling flight, which, instead of being a succession of undulating and rapid movements, is rather labored and steady flapping, somewhat like that of the jay. The notes of this bird seem to be few; a harsh call, rarely uttered in summer, when it seeks concealment for itself and nest, is quite unlike any other woodpecker's cry. The flocks of young, which in fall associate together to numbers of eight or ten, are more noisy, though even then quiet compared to the flicker. The California woodpecker, as I have seen it in the autumn, resembles this bird somewhat in habits, but seems not to feed so much on fruit, and in cries, flight, and habits to resemble much more the common wood-

pecker. In brilliancy and richness of plumage it however equals but does not surpass this species. (p. 162)

The following birds have been named in honor of Cooper:

Cooper's Hen-Hawk, *Buteo cooperi* Cassin

Cooper's Song Sparrow or San Diego Song Sparrow, *Melospiza melodia cooperi* Ridgway

Cooper's Tanager, *Piranga rubra cooperi* Ridgway

Cooper's Grebe, *Podiceps cooperi* Lawrence (synonym: *Columbus colymbus holbellei*)

Cooper's Shearwater (Loomis), *Puffinus creatopus* Coues

Cooper himself described and named:

Baird's Cormorant, *Graculus bairdei* Cooper (*Phalacrocorax pelagicus resplendens* Audubon)

Whitney's Elf-Owl, *Athena whitneyi* Cooper (*Micropalus whitneyi*)

Lucy's Warbler, *Helminthophaga luciæ* (now *Vermivora luciæ*), was named by Cooper for Baird's daughter, Lucy Hunter Baird)

White-bellied Swallow, *Hirundo bicolor vespertina* Cooper.

(List furnished by Theodore S. Palmer)

Cooper's Hawk, *Falco cooperi*, was named for William Cooper, father of Surgeon Cooper.

PRINCIPAL BIOGRAPHIC SOURCES

1. W. O. Emerson, Dr. James G. Cooper, a Sketch, *Bulletin of the Cooper Ornithological Club*, January-February, 1899, i, no. 1, 1-5.
2. Wm. H. Dall, *Science*, 15 August, 1902, n. s. xvi, no. 398, 268-269.
3. W. O. Emerson, In Memoriam: Dr. James G. Cooper, *The Condor*, September-October, 1902, iv, no. 5, 101-103.
4. J. Grinnell, *Dictionary of American Biography*, 1937, iv, 406-407.
5. T. S. Palmer, Notes on Persons whose Names Appear in the Nomenclature of California, *The Condor*, September, 1928, xxx, no. 5, 273.
6. *The Auk*, 1902, xix, 421-422.

Elliott Coues (1842-1899)

Surgeon, United States Army

Elliott Coues was born in Portsmouth, New Hampshire, 9 September, 1842, the son of Samuel Elliott Coues, a man who had "a keen perception of the beauties and mysteries of nature and an ever-pervading feeling of philanthropy." Samuel Elliott Coues was for several years president of the American Peace Society and author of various papers. The family (name pronounced "*Cows*") came originally from the island of Jersey, so that the future naturalist's descent was partly French and partly Scottish, a combination which has often produced men of genius. Coues's mother was Charlotte Haven Ladd, a descendant of John Mason, an original grantee of New Hampshire.

When Elliott was eleven years old (1853) his father removed to Washington and in the national capital much of his life was spent. It is said that the father expected to be made Librarian of Congress but obtained instead only a minor clerkship in the Patent Office. Having been prepared for college at Gonzaga College Elliott entered Columbian College (now George Washington University) at the age of seventeen, receiving the degree of Bachelor of Arts in 1861. In the following year he was granted the honorary degree of Master of Arts, and in 1862 was appointed a Medical Cadet and was called to active duty in the War Between the States. His M. D. was received in 1863, also from what is now George Washington University.

Elliott Coues was but nineteen years old when he wrote his first paper in ornithology, *A Monograph of the Tringeæ of North America*, which was published in the *Proceedings of the Academy of Natural Sciences*, Philadelphia, for July, 1861, xiii, 170-205. The work exhibited "deep knowledge of the subject and a facility of expression." The material for this work was acquired on a visit to Labrador. Two other contributions appeared that same year and in the same journal. The first was *Notes on the Ornithology of Labrador*, and the second *A Monograph of the Genus Ægiothus, with descriptions of new species*. These works, it will be observed, were written two years before he received his M. D. Four papers followed in the next year, they too preceding his doctorate. These publications, even the first, were notable for the care and complete-

ness with which the subjects were treated, and " would have been creditable to an author of much greater experience, and fully foreshadowed the high character of his subsequent work in systematic ornithology." (Allen).

Coues thus introduces his monograph on the *Tringeæ of North America*:

> In the latter part of 1860, during the examination at the Smithsonian Institution of an extensive and valuable collection of birds made by Messrs. Robert Kennicott and Bernard R. Ross in the vicinity of Great Slave Lake and McKenzie's River, my attention was directed to a Sandpiper, nearly allied to *Actodromas maculata* and *Bonapartei*, but differing from both in many important features. Subsequent examination having proved it to be without doubt distinct from these, or any other North American Sandpipers, I was authorized by the Secretary of the Institution to describe and name it. To do so properly, necessarily involving a somewhat extended study of the North American Sandpipers, I was induced to undertake a monographic sketch of the section, as well as of the particular genus to which the new species belongs.
>
> In the following pages it has been attempted to present the leading features of the group; to give the diagnosis of several genera and species, with a detailed description when such appeared necessary; together with the synonymy of each species and a discussion of doubtful points of nomenclature and affinity. In how far, however, this aim has been accomplished, must be left to others to judge.
>
> To Professor Henry, Secretary of the Smithsonian Institution, my grateful acknowledgments are due for the opportunity of examining at leisure the entire Smithsonian collection of Sandpipers, and also for access to those works necessary to the compilation of the list of synonyms. The references have all been personally verified, except in a few cases for which the authority is given. Though the list is necessarily incomplete, it is believed that no important synonym is omitted. Should, however, errors be detected in this or any other portion of the article, it is hoped that they will be found to be other than those of negligence or carelessness.

With these introductory paragraphs the youthful ornithologist launches into a detailed consideration of the Sandpipers, " a section," he says, " of Tringeæ of equal rank with Scolopaceæ," both pertaining to the subfamily of Scolopacinæ. One of the Sandpipers described is *Pelidna americana* Coues or American Dunlin. Another is *Actodromas bairdii* Coues, or Baird's Sandpiper, which is the species mentioned in Coues's introduction (see above). *Actodromas*

cooperi Coues, Cooper's Sandpiper, is also described, the name being given in honor of Surgeon Cooper, U. S. Army. (Elliott Coues, A Monograph of the Tringeæ of North America, *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1861, 170-205).

That Elliott Coues when less than twenty years of age could write such a scholarly monograph as that on North American Sandpipers, is remarkable, but that he could publish in the same volume of an important scientific journal a second monograph is surely a record with few equals. It is of more than passing interest to record that the chairman of the publications committee of the *Academy* at this period was that fine old military surgeon and naturalist, Dr. Joseph Leidy.

Coues's second article is: *Notes on the Ornithology of Labrador.* He thus begins it:

> During the summer of 1860 I accompanied an expedition in charge of J. W. Dodge, Esq., which visited the coast of Labrador in order to procure for the Smithsonian Institution specimens of the birds to be found there, together with their nests and eggs, and to study their habits during the breeding season. . . . In the following pages, however, are embodied the results of my investigations; and though the list of the species noticed is, from my limited opportunities for observation, necessarily incomplete, it is hoped that it will not be found entirely wanting in points of interest with regard to the habits of the birds which pass the breeding season in Labrador.

Then we read descriptions of the birds studied, among them being *Ægiothus fuscences* Coues or *Dusky Red Poll*, and *Actodromas minutilla* Coues. An extract from the forty-two page monograph will give an idea of the young man's powers of description and of his style which later became so famous. In describing the *Arctic Puffin*, he says:

> Another extract from my journal will portray, perhaps more graphically than could be done in any other style, the manners of the birds on being invaded. "Hardly had our boat touched the shore when we leaped out, guns in hand, and at once scattered over the island. As we advanced along the sides, the affrighted birds darted past us like arrows, issuing from their burrows beneath our feet and around us, and making directly for the water. Those already disturbed flew in every direction above us, while thousands rested on the water in a dense mass at a little distance. I took my stand on a flat rock, and in less than an hour a pile of Puffins, more than I could carry, lay at my feet. Shortly after I commenced firing the birds formed themselves

into an immense circle, of a diameter of perhaps a third of a mile, one point of which just grazed the island. It was astonishing to see with what precision this circle was preserved, each bird flying directly in the wake of the one that preceded. I had merely to stand facing the advancing birds, and no better opportunity for continual slaughter could be desired. I now realized what I had been told, but had found hard to believe, that a wagon might be filled with the birds by a tolerably expert marksman, shooting them at just such a moment that they should fall into it. The poor things seemed not at all aware of the nature of the danger that threatened them; flying so close past me that I could almost strike them with my gun. During the continual firing the birds would emerge from their holes every minute or two. . . . On emerging from the holes the birds generally looked around for a moment to see what was the matter, and then in great haste fluttered and tumbled down to the water below, in which they immediately dived, and swimming swiftly under water reappeared at some distance. From the countless thousands flying around me I did not hear the slightest note of any kind; they flew in perfect silence. When wounded, if they fell on the land, they immediately ran and threw themselves into the nearest hole; if in the water, they dived and swam as far under the surface as their strength allowed. I observed not the slightest indication of any sympathy for those wounded or killed on the part of the other birds, as stated by Audubon. The survivors did not notice them in the least, though they lay exposed everywhere on the rocks, and floated about on the water. . . ."

When taken in hand the Puffin utters a loud, hoarse, croaking scream, at the same time fighting most furiously. They are capable of inflicting a very severe wound with their powerful bills, easily drawing the blood. Their long and strong inner claw is also an effective weapon, so that by dint of scratching, biting, or struggling, they proved difficult customers to manage. The more courageous of our party seldom held one more than a few moments before he was glad to set it at liberty. Indeed, their rage at being caught is so ungovernable, that two held together attacked each other with fury, and a single one held up by the wings, bit its own wing and scratched its own face most energetically.

I could not but admire the beautiful provision of nature with regard to furnishing this bird with the means of excavating its burrow with facility. The inner claw of each foot is very long much curved and excessively sharp. To preserve it so, when not in use, it always lies perfectly flat, so that the point does not rest on the ground. In digging and fighting, however, it is held upright, and then becomes a very effective weapon. (E. Coues, Notes on the Ornithology of Labrador, *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1861, 215-257.)

Coues's oldest friend has left us a picture of him at this period:

It is now forty years ago [i. e. 1861], when on a visit to Professor Baird

in Washington, one evening, in company with my old friend Dr. Gill, I first met Elliott Coues. He was then in his teens, a student of medicine, frank, simple, honest and confiding, with a boy's generous impulses, and the glorious enthusiasm of the ornithologist manifest in speech and action. The friendship then formed continued without a break or a hasty word ever having been exchanged with tongue or pen throughout all the intervening years. And yet we thought very differently on many subjects; but such was our confidence in each other's honest intention and unreserved frankness that we could, and did many times, argue on different sides, both orally and in writing, with an energetic earnestness that would have been highly dangerous to our continued friendship if we had not understood each other so well. First among his most eminent characteristics was his love of truth, and he was constantly striving with all the force of his energetic nature to search it out and take its teaching to himself wherever he might find it, careless where it might lead him or what preconceived views or opinions it might overthrow or destroy. (D. G. Elliot, *The Auk*, January, 1901, xviii, no. 1, 1-11.)

About this time, Coues, in collaboration with D. Webster Prentiss (*q. v.*), published a "*List of Birds Ascertained to Inhabit the District of Columbia*, with times of arrival and departure of such as are non-residents, and brief notice of habits, etc." (*Smithsonian Institution, Annual Report for 1861*, Washington, 1862, pp. 399-421). A second edition of this study was published in 1883. (*U. S. National Musuem Bulletin* No. 26).

Elliott Coues passed the competitive examination for admission to the Medical Department of the United States Army in 1863. but not yet being of age could not receive his commission. He was therefore appointed Acting Assistant Surgeon, and spent a year at the Mount Pleasant Hospital, Washington. In 1864 he was duly commissioned Assistant Surgeon in the Regular Army, and was promptly ordered West.

Captain Charles Albert Curtis, United States Army, retired, in 1902 published reminiscences of his service with young Assistant Surgeon Coues at the latter's first Army post. Captain Curtis, then First Lieutenant, Fifth Infantry, was acting quartermaster of a mixed column of infantry and cavalry, ordered to rendezvous at Los Piños, New Mexico, in preparation for a march to Prescott, Arizona. They had many wagons of supplies and were a tempting prize to the Indians, through whose country the troops had to pass. Coues was the medical officer ordered to accompany the troop. Captain Curtis continues:

On the evening of the 15th day of June [1864], at the mess table of the officers of the expedition, I first saw Dr. Elliott Coues. He was at that time still some months short of being twenty-two years old, and had but recently been commissioned as assistant surgeon in the army. He was a man of good features and figure, a little above medium height, with light brown hair and no beard or mustache, and of a complexion bronzed in his calling of field ornithologist. In his conversation throughout the meal we gathered that he had served as a medical cadet in the Army of the Potomac for some time before he was advanced to his present rank, and that he had hunted and collected birds in Labrador. He also remarked, with pardonable pride, that he had been sent as surgeon in charge of our column at the request of the Smithsonian Institution, that he might "shoot up the country between the Rio Grande and the Rio Colorado," and that as soon as he should report that he had done so he was to be relieved and ordered to Washington. He also showed the commanding officer and myself an order from the Quartermaster-General, requiring us to furnish free transportation at all times to aid in securing the collections he should make.

Ornithology was the Doctor's special cult, but he was also prepared to make collections in other branches of natural history. For creeping, crawling and wiggling things he had brought along a five-gallon keg of alcohol. But the reptilian branch of his researches failed utterly in the early stage of the march, for the soldiers, in unloading and loading the wagon, had caught the scent of the preservative fluid, and, although it already contained a considerable number of snakes, lizards, horned toads, etc., the stuff, diluted from their canteens, did not prove objectionable to the chronic bibulants. Some of them, however, did look decidedly pale about the gills when the head of the empty keg was smashed in and the pickled contents exposed to view. They had really supposed they had been drinking chemically pure alcohol.

From the beginning of the march on the 16th day of June until its close, on the 29th day of July, Doctor Coues never ceased, except for a brief interval, making excursions along the flanks of the column and arriving in camp with many specimens. Clad in a corduroy suit of many pockets and having numerous sacks and pouches attached to his saddle, he regularly rode out of column every morning astride of his buckskin-colored mule, which he had named Jenny Lind on account of her musical bray. Rarely did we see him again until we had been some hours in the following camp but we sometimes heard the discharge of his double-barreled shotgun far off the line of march. He usually brought in all his pockets and pouches filled with the trophies of his search, and when he sat upon the ground and proceeded to skin, stuff and label his specimens, he was never without an interested group of officers and men about him. To anyone interested to learn the art of preparing specimens he became an earnest and painstaking instructor. In time pretty much every person in the command was contributing something to the Doctor's packing cases.

Fig. 9.

ELLIOTT COUES.
(1842-1899)

Surgeon, United States Army.

Photograph made in 1864 when Coues was first commissioned in the Army.

(Photograph in possession of his life-long friend, D. G. Elliot, and published in *Bird-Lore*, January-February, 1902, iv, no. 1, 3).

When we reached the most dangerous part of our march and frequent attempts to stampede our grazing flock and herds were made by the lurking red man, the Doctor was cautioned to remain near the escort, but the flitting of rare plumage or the utterance of a strange note would often tempt him away and give us great anxiety until he returned. In three collisions with the Indians he showed us he was possessed of true soldierly spirit.

At one point the danger became so great that the discharge of firearms by any member of our party was strictly forbidden and all were told that should a shot be heard we were all to rally in its direction. One day we rallied in hot haste to the rear, only to meet the ornithologist holding up a beautiful and rare specimen, saying: "I really could not allow this bird to escape without causing a serious loss to science." "Well," replied the commanding officer, "I shall deprive science of any further collections for a week by placing you in arrest and taking possession of your gun and ammunition." The arrest, however, did not last until next morning, when the colonel, having slept off his vexation, delivered Doctor Coues a lecture on military science, with particular reference to service in an Indian country, and told him what he might expect if he did not remain near the escort, and refrain from firing until we were out of that region.

Professionally, the Doctor was a good surgeon, and never neglected his duty. In Arizona for a year he continued his collecting throughout a large portion of the territory and, when he was relieved from duty and ordered to Washington in November 1865, he told me he should take with him over two hundred and fifty distinct species of birds, and six hitherto unknown to science. (*Bird-Lore*, January-February, 1902, iv, no. 1, 5-7.)

Firsthand information of the beginning of his Army career is found in Coues's own Journal:

July 8, 1864.—We read of the delightful and equiable climate of New Mexico, but we live and learn. Last night we shivered under blankets and blew our numb fingers this morning. By ten it was hot; at eleven, hotter; twelve, it was as hot as—it could be. The cold nights stiffen our bones, and the hot days blister our noses, crack our lips, and bring our eye-balls to a stand-still. Today we traversed a sandy desert; no water last night for our worn-out animals, and very little grass. The "sand-storms" are hard to bear, for the fine particles cut like ground glass; but want of water is hardest of all. For some time it has been a long day's march from one spring or pool to another; and occasionally more; then the liquid we find is nauseating, charged with alkali, tepid, and so muddy that we cannot see the bottom of a tin cup through it. Here at our noon-day halt there is not a tree—scarcely a bush—in sight, and the sun is doing his perpendicular best. In the Sibley tent the heat is simply insupportable, and we are lying curled up like rabbits in the slight shade we can find in the rain-washed crevices of the "Well."

Jacob's Well is an undisguised blessing and, as such, a curiosity. It is an enormous hole in the ground, right in the midst of a bare, flat plain; one might pass within a hundred yards and never suspect anything about it. The margin is nearly circular, and abruptly defined; the sides very steep—almost perpendicular in most places; but a path, evidently worn by men and animals, descends spirally, winding nearly half way around before reaching the bottom. It is, in fact, a great funnel, a hundred yards wide at the brim, and about half as deep; and at the bottom there is a puddle of green, slimy water. Tradition goes, of course, that it is a "bottomless pit"; and as the water has not perceptibly diminished after all our party and five hundred mules and cattle had had their fill, the story may go for what it is worth. The water is bad enough —warm, and probably muddy, though the mud is not visible, owing to the rich green color of the dubious liquid. It contains, however, some suspicious looking creatures, "four-legged fishes," said the man who caught several with hook and line. They suck the bait like catfish, and look something like them, barring the legs and long, fringe-like gills. [These creatures are evidently *Amblystoma mubulosum*, a kind of batrachian related to the salamanders.]

It is a scene of utter desolation; our bodily discomfort begets vague fears, and a sense of oppression weighs us down. The leaden minutes creep on wearily and noiselessly, unbroken even by the hum of an insect; two or three blackbirds, hopping listlessly about as if they wished they were somewhere else but had not energy enough to go there, are the only signs of life that greet our faithful animals and ourselves. (*American Naturalist*, June, 1871, v, no. 4, 195-200; also in *Bird-Lore*, January-February, 1902, iv, no. 1, 8-9.)

Assistant Surgeon Coues remained at his first station, Fort Whipple, Arizona, for sixteen months. During his service there he participated in a march from Fort Whipple to San Pedro, on the coast of Southern California, the journey being via Fort Mojave and Fort Yuma. The ornithological results of the journey are given in two papers, *Ornithology of a Prairie Journey* (*The Ibis*, April, 1865, 157-165) and *From Arizona to the Pacific* (*The Ibis*, July, 1866, 259-265).

Ornithology at Fort Whipple in 1864 and 1865 must have been exciting. Coues was frequently, on account of the war with the Apache Indians, unable to get out of sight of the fort. It was not too much to imagine that while he watched the birds, Apaches watched him. Often when he wanted a specimen, it was unsafe to fire off his gun; when he might shoot, the birds were often too wary. Ornithology under these conditions "was something too spicy for comfort." His memories of the gentle little titmouse and the beautiful phainopepla or flysnapper were forever colored by the discovery, made while following these birds, of the still bleeding naked bodies of soldiers from the fort. (D. C. Peattie, *A Gathering of Birds*, 269.)

Assistant Surgeon Coues was still engaged in his army duties when he wrote his famous "*Key to North American Birds*, containing a concise account of every species of Living and Fossil Bird at present known from the Continent north of the Mexican and United States Boundary. Illustrated by six steel plates and upwards of 250 woodcuts." This appeared in October, 1872. This is unquestionably one of his greatest contributions to ornithology. It was designed as a popular handbook of North American birds, and was one of the first works to introduce the "key" method of botanical manuals to zoölogy. It was at the same time a taxonomic revision of North American birds from the standpoint of a competent authority.

The first edition of the *Key* contained an "Introduction" of some sixty pages, giving a general account of the external characters of birds, an explanation of the technical terms used in ornithology, a concise exposition of the principles of classification and nomenclature, an artificial key to the genera, and much other information useful to the amateur. A systematic synopsis of North American birds followed, with brief descriptions of the species, indications of their geographical distribution, and references to leading authorities. By skillful use of language and several hundred illustrations, the amount of text was reduced to small compass without serious sacrifice of clearness. The higher groups were quite fully characterized, and a synopsis of North American birds was added. Many changes in classification were introduced, and many "species" were reduced to "varities," this being before the days of trinomial nomenclature.

The second edition (1884) was prepared on essentially the same lines, but it was entirely rewritten and greatly augmented, containing twice the number of pages and, through use of smaller type, nearly four times the amount of matter, and a large increase in the number of illustrations.

The *Key* now comprised four "Parts," namely: Part I, "Field Ornithology," a reprint, with slight modifications, of a separate work issued by the author under that title in 1874. Part II, "General Ornithology," consisted of the introductory matter of the first edition, greatly amplified, with the further addition of nearly one hundred pages of new matter on the anatomy of birds. Part III, "Systematic Synopsis of North American Birds," is the "Systematic Synopsis" of the first edition, greatly extended by further diagnosis and the addition of concise biographies of the species. Part IV is the "Systematic Synopsis of the fossil Birds" brought down to date and the subject more fully presented. The nomenclature is materially changed throughout, some twenty or more groups previously rated by him as subgenera being here given full generic rank, entailing corresponding changes in the names of species.

The four parts are preceded by an "Historical Preface" of twenty pages

of wholly new matter, which is a concise history of North American ornithology, from its earliest beginnings in 1612 to the year 1860. The history is divided into epochs and periods and the work and impress of each prominent author is briefly and judicially weighed, with the author's usual felicity of characterization.

The third edition (1887) is the same as the second, with the addition of an appendix of thirty pages, "exhibiting the nomenclature of the American Ornithologists' Union Check-List in comparison with that of the Key and including descriptions of additional species, etc.," the American Ornithologists' Union Check-List of North American Birds having appeared during the interval between the second and third editions of the *Key*. The names employed in the two systems are arranged in parallel columns, with the interpolation of descriptions of some sixty species and subspecies not previously included in the *Key*.

The fourth edition (1890) is the same as the third, with the addition of a second appendix, to include a number of further additions of species and subspecies.

The fifth edition (1903), issued in two volumes instead of one, is again largely a new work, the synoptic portion having been wholly rewritten and greatly enlarged, the classification and arrangement considerably altered, and the nomenclature revolutionized. This being the first revised edition of the *Key* since the appearance of the American Ornithologists' Union Check-List in 1885, we have here the nomenclature of this list, which Dr. Coues did so much to shape, for the first time adopted in the *Key*, the author often waiving his own opinions and preferences for the sake of conformity with the Check-List. Many of the old illustrations were discarded and hundreds of new ones added, made expressly for the work. The "Historical Preface," the "Field Ornithology," and the "General Ornithology" are the same as in former editions, except that in the latter, besides slight verbal changes in the text, much new matter is added. The changes in Part III, besides those of nomenclature and arrangement, consist in the amplification of many of the diagnoses, a revision of the ranges of the species and subspecies, the addition of bibliographical references, many vernacular synonyms, and much critical and historical comment on questions of nomenclature (almost wholly excluded in former editions); also the characterization of the higher groups and more elaborate and extended, their composition and relations being stated with masterly clearness and comprehensiveness. . . . It is a "masterpiece of original ornithological work, which alone would long keep green the memory of its gifted author." The *Key* is a "well-known and old favorite, whose thirty years i. e. in 1903 of practical usefulness have won for it unstinted and well-merited praise, and in its new form will prove for many years to come a boon alike to the amateur and the professional student of North American birds. The *Key* of 1872 was an innovation and an experiment in ornithological literature; its practicability was evident from the outset, and it

KEY

TO

NORTH AMERICAN BIRDS

CONTAINING A CONCISE ACCOUNT OF EVERY SPECIES OF

LIVING AND FOSSIL BIRD

AT PRESENT KNOWN FROM THE CONTINENT NORTH OF THE MEXICAN AND UNITED STATES BOUNDARY.

ILLUSTRATED BY 6 STEEL PLATES, AND UPWARDS OF 250 WOODCUTS.

BY

ELLIOTT COUES,

ASSISTANT SURGEON UNITED STATES ARMY.

SALEM: NATURALISTS' AGENCY.
NEW YORK: DODD AND MEAD.
BOSTON: ESTES AND LAURIAT.
1872.

Fig. 10.

Title Page of Coues's *Key*, first edition.

"It has had above all others the most important influence on ornithology in our own land. It is a work that in conception and masterly manner in which it is carried out in all its details, stands as one of the best, if not *the* best, bird book ever written"—J. A. Allen of the National Academy of Sciences.

proved to be the forerunner of almost numberless successors of 'key' manuals in various departments of zoölogy. The author's final revision of this greatest of his many contributions to ornithological literature will make a new generation of bird students his debtors and admirers." [J. A. Allen, *The Auk*, 1904, xxi, 296.] It was his last piece of literary work, and could he have lived to carry it through the press its publication would have been not only less delayed, but the work would have had the benefit of his final touches.

The *Key* was recognized, abroad as well as at home, as a work of the highest excellence. In a review of the second edition in *The Ibis* (1885, 100-101), a journal not noted for its use of superlatives in its notices of current literature, the following high praise is accorded the *Key*:

"It is, however, to Part II of the present volume that we must specially direct the reader's attention. In this part there is condensed into some 180 pages a more complete account of the structure and classification of birds, brought up to the present standard of our knowledge, than any other with which we are acquainted. . . . So much information that cannot be got at elsewhere is brought together in this comprehensive treatise, that it ought to be in the hands of every ornithologist, whether he is a special student of the American Avifauna or not. It is, in fact, our deliberate opinion that Coues's new *Key* is, as one of the veteran ornithologists of the continent has tersely put it, in a private letter, 'one of the best and most useful bird books ever written'; and we commend it to our readers accordingly." (J. A. Allen, *Biographical Memoir of Elliott Coues*, presented to the National Academy of Science, April, 1909, 402-404.)

A sixth edition of the *Key*, with a short foreword by Dr. Theodore S. Palmer, was published twenty-eight years after Coues's death. It is in two volumes, both indexed, consisting of 1152 pages, colored frontispiece, and 750 fine illustrations, Boston, 1927.

It is not difficult to find superlative statements about the value of Coues's *Key*. It has had, says Elliot, "above all others the most important influence on ornithology in our own land." It is, he continues, "a work that in its conception and masterly manner in which it is carried out in all its details stands as one of the best if not *the* best bird book ever written." (*The Auk*, January 1901, xviii, 4). Even in 1939, sixty-seven years after the book was first published, Peattie says of it, "it is not even now really superseded, and its introduction itself forms a concise treatise on ornithology." (*A Gathering of Birds*, 270).

Closely conjoined with the *Key to North American Birds* are three other publications by Dr. Coues, namely, a *Check-List of North*

American Birds, his *Field Ornithology*, and a second edition of the *Check-List*, entitled *The Coues Check-List of North American Birds, Second Edition*.

Let us return now to a chronological consideration of Coues's career, which has been for the moment disregarded in a complete account of the *Key* in its several editions.

Following his service at Fort Whipple, Coues was stationed successively at Fort Macon, North Carolina, and Fort Randall, Territory of Dakota. During this period he was appointed naturalist and secretary for the Boundary Commission engaged in surveying the Canadian frontier from the Lake-of-the-Woods to the Pacific Ocean. It is an interesting coincidence that another great army medical officer and ornithologist, Assistant Surgeon Mearns, was a decade later appointed to a similar position with the Mexican-United States International Boundary Commission. Thus was the natural history of the northern and of the southern borders of the United States studied by such officers. Coues was afterwards, as we shall see, made secretary and naturalist for the Geological Survey of the Territories; that is, the present northwestern states.

On 13 March 1865, Coues was given the brevet of Captain, United States Army, " for faithful and meritorious services during the late war " (Hamersly, 376).

During the decade above noted, his contributions to ornithology were both numerous and important. Besides the papers already mentioned there appeared a series of monographs (1862-1868) on the various water birds, viz., *Synopsis of the North American Forms of the Colymbidæ and Podicipidæ* (*Proc. Acad. Nat. Sci.* Philadelphia, 1862, xiv, 226-233); *Revision of the Gulls of North America* (ibid., 291-312); *A Review of the Terns of North America* (ibid., 535-559); *Critical Review of the Family Procellariidæ* (ibid., 1864, xvi, 72-91, 116-144; 1866, xviii, 25-33, 134-197); *A Monograph of the Alcidæ* (ibid., 1868, xx, 2-81). Here may also be mentioned his *Classification of Water Birds* (ibid., 1869, xxi, 193-218); his *Studies of the Tyrannidæ*, Part I; *Revision of the Species of Myiarchus* (ibid., 1872, xxiv, 56-81); and his *Material for a Monograph of the Sphenicidæ* (ibid., 170-212). During this same decade he published several papers on the anatomy of birds, viz.,

The Osteology of Colymbus torquatus, with notes on its Myology (Mem. Boston Soc. Nat. Hist., 1866, i, pt. 2, 131-172); *Bird's-Eye Views* on the structure of the eye in birds, *American Naturalist*, 1868-9, ii, 505-513, 571-583); *On a Chick with Supernumerary Legs* (*Proc. Boston Soc. Nat. Hist.*, 1869-70, xiii, 78-82); and *Mechanism of Flexion and Extension of Birds' Wings* (*Proc. Amer. Assn. Adv. Sci.*, 1872, xx, 278-284). This last paper was read at the meeting of the American Association for Advancement of Science in 1871, and illustrates something of Coues's powers of observation and deduction. The following is a contemporary abstract:

Dr. Coues' proposition is, that flexion of the forearm upon humerus produces flexion (adduction) of the hand upon the forearm, by osseous mechanism alone, and conversely: extension of the forearm causes extension (abduction) of the hand. The point of the article consists in a demonstration of the fact that, in spreading and folding the wing, the radius slides lengthwise along the ulna to a certain extent. Recapitulating certain points in the anatomy of the elbow and wrist, the author shows that this sliding is produced by the relative size, shape and position of the humeral surfaces with which the radius and ulna respectively articulate; these being such, that in flexion of the forearm the radial surface is nearest the wrist-joint, and extension the ulnar one; and consequently the two bones of the forearm occupy different relative positions in flexion and extension. In flexion, the radius is pushed forward and projects somewhat beyond the end of the ulna, impinging upon the radio-carpal bone (scapholunar), and pushing the pinion around the centre of motion of the wrist-joint so that it is more or less flexed. In extension, the reverse motion takes place, from the pulling back of the radius.

The proposition is carefully demonstrated, illustrated with three figures, and likewise shown to be susceptible of ocular proof by direct experiment. Several interesting corollaries are also drawn. Some such mechanism is shown to be an anatomical necessity, from the structure of the wrist-joint, to provide for the extremes of abduction and adduction that take place in the wrist, without straining the joint. Another obvious purpose subserved is equalization of muscular power, by relegating a part of the work, that the hand muscles would otherwise have to perform, to the large flexor and extensor of the upper arm; and an actual saving of a certain amount of muscular effort, this being replaced by automatic movements of the bones themselves. Having seen no account of this mechanism the author is inclined to think it may be unnoticed. It is at any rate a new explanation of the design of the peculiar shape and position of the radial articulating surface of a bird's humerus, far more important than that hitherto assigned, viz.: its causing

simply the wellknown *obliquity* of flexion of the forearm. (*The American Naturalist*, September, 1871, v, nos. 8-9, 513-514.)

Two of Coues's other important ornithological works were prepared while he was on active duty at Army posts in the West. In 1874 he published "*Birds of the Northwest*: A Handbook of the Ornithology of the Region drained by the Missouri River and its Tributaries" (*U. S. Geol. and Geogr. Surv. Terr., Miscell. Publ. No. 3*, pp. i-xii, 1-791). It treats primarily of the birds of the Missouri region (about 450 species), with reference to their geographical distribution, habits, and synonymy, and the specimens taken on various expeditions under the late Dr. Ferdinand Vandiveer Hayden. The new genera and one new species are described in the work, which is an important summary of the ornithology of the region treated, as then known and "will ever remain a standard work of reference." (Allen, *loc. cit.*).

In the same year, *Field Notes on Birds observed in Dakota and Montana along the Forty-ninth Parallel during the Seasons of 1873 and 1874* appeared. Herein were embodied the results of Coues's field work as naturalist to the United States Northern Boundary Boundary Commission. The 850-mile line surveyed extended from the Red River of the North to the Rocky Mountains.

> The faunal characteristics of different portions of the route are compared, followed by a systematic list of the species observed, with the localities, dates and measurements of the specimens taken, and extended bibliographical notes on many of the species, some of which were previously little known, resulting altogether in a large amount of wholly new information about the birds of this region. (Allen, 409-410.)

In 1878 another of Coues's great books appeared, "*Birds of the Colorado Valley*: A repository of Scientific and Popular Information concerning North American Ornithology. Part I, Passeres to Laniidæ. Bibliographical Appendix. Miscellaneous Publication No. 8, U. S. Geol. and Geogr. Surv. Terr., pp. i-xvi, 1-807, figs. 1-70." This work contained some of the finest bird biographies that have appeared, and was a marked event in the literature of North American ornithology. It added immensely to the reputation of the already wellknown and already popular author.

In the "Prefactory Note," Coues said:

It is possible to make natural history entertaining and attractive as well as instructive, with no loss in scientific precision, but with great gain in stimulating, strengthening, and confirming the wholesome influence which the study of the natural sciences may exert upon the higher grades of mental culture; nor is it a matter of little moment so to shape the knowledge which results from the naturalist's labors that its increase may be susceptible of the widest possible diffusion.

While the technical portions of the work measure up fully to the highest scientific standards, Coues was no less successful in his hope to make it interesting. Here are three extracts from this book, being the ones selected by Donald Culross Peattie in his recent *A Gathering of Birds*, as illustrative of Coues's interesting ornithological writing —" rugged narratives " as Peattie calls them.

In Coues's account of the *Plumbeous Bush-Tit*, the following paragraph occurs:

These queer little elfs were very numerous about Fort Whipple, where I saw them all the year round, and learned as much about them as any one seems to know. Though living in a coniferous region, they avoided the pine forests, keeping in the oak scrub of the hillsides, and the undergrowth along the creek bottoms and through the numerous ravines that make down the mountainsides. They endured, without apparent inconvenience, an extreme cold which sometimes proved fatal to birds of much more seeming hardihood, like Ravens for instance; and were as active and sprightly in the depth of winter as at any other time. I used to wonder how they managed, in such tiny animal furnaces, to generate heat enough to stand such a climate, and speculated whether their incessant activity might not have something to do with it. They always seemed to me model store-houses of energy—conserved to a degree in cold weather, with consumption of no more than was needed to keep them a-going, and thus accumulated for the heavy draft required when, in the spring, the arduous duties of nest-building and rearing a numerous family devolve upon them. . . . They are extremely sociable—the gregarious instinct common to the Titmice reaches its highest development in their case, and flocks of forty or fifty—some say even of a hundred—may be seen after the breeding season has passed, made up of numerous families, which, soon after leaving the nest, meet kindred spirits, and enter into intimate friendly relations. Often, in rambling through the shrubbery, I have been suddenly surrounded by a troop of the busy birds, perhaps unnoticed till the curious chirping they keep up attracted my attention; they seem to *pervade* the bushes. If I stood still, they came close around me, as fearless as if I were a stump, ignoring me altogether. At such times, it was pleasant to see the earnestness with which they conducted affairs, and the energy they

displayed in their own curious fashion, as if it were the easiest thing in the world to work hard, and quite proper to attend to serious matters with a thousand antics. They are droll folk, quite innocent of dignity, superior to the trammels of decorum, secure in the consciousness that their wit will carry off any extravagance. I used to call them my merry little philosophers—for they took the weather as it came, and evidently knew how much better it is to laugh at the world than cry with it. When fretted with the friction of garrison-life, I have often sought their society, and amused myself like another Gulliver among the Liliputians. (From *Birds of the Colorado Valley.*)

Of the *Cow-bird*, which though not related to the European cuckoo, has the same habit of laying its eggs in the nests of other birds, Coues wrote:

It does not appear that the Cow-bird ever attempts to take forcible possession of a nest. She watches her chance while the owners are away, slips in by stealth, and leaves the evidence of her unfriendly visit to be discovered on their return, in the shape of the omenous egg. The parents hold anxious consultation in this emergency, as their sorrowful cries and disturbed actions plainly indicate. If their nest was empty before, they generally desert it, and their courage in giving up a cozy home results in one Cow-bird the less. Sometimes even after there is an egg of their own in the nest, they have nerve enough to let it go, rather than assume the hateful task of incubating the strange one. But if the female has already laid an egg or two, the pair generally settle into the reluctant conviction that there is no help for it; they quiet down after a while, and things go on as if nothing had happened. Not always, however, will they desert even an empty nest; some birds have discovered a way out of the difficulty—it is the most ingenious device imaginable, and the more we think about it the more astonishing it seems. They build a two-story nest, leaving the obnoxious egg in the basement. . . .

It is interesting to observe the female Cow-bird ready to lay. She becomes disquieted; she betrays unwonted excitement, and ceases her busy search for food with her companions. At length she separates from the flock, and sallies forth to reconnoiter, anxiously indeed, for her case is urgent, and she has no home. How obtrusive is the sad analogy! She flies to some thicket, or hedgerow, or other common resort of birds, where, something teaches her—perhaps experience—nests will be found. Stealthily and in perfect silence she flits along, peering furtively, alternately elated or dejected, into the depths of the foliage. She espies a nest, but the owner's head peeps over the brim, and she must pass on. Now, however, comes her chance; there is the very nest she wishes, and no one at home. She disappears for a few minutes, and it is almost another bird that comes out of the bush. Her business done, and troubles over, she chuckles her self-gratulations, rustles her plumage to adjust it trimly, and flies back to her associates. They know what has happened,

Fig. 11.

ELLIOTT COUES.
(1842-1899)

Surgeon, United States Army.

(Photograph in the Collection of the Smithsonian Institution. From this picture the portrait of Coues in the Division of Birds, United States National Museum, was painted).

but are discreet enough to say nothing—charity is often no less wise than kind. (From *Birds of the Colorado Valley.*)

In his chapter on the *Cliff Swallow* we read:

It is pleasant to watch the establishment and progress of a colony of these birds. Suddenly they appear—quite animated and enthusiastic, but undecided as yet; an impromptu debating society on the fly, with a good deal of sawing the air to accomplish, before final resolutions are passed. The plot thickens; some Swallows are seen clinging to the slightest inequalities beneath the eaves, others are couriers to and from the nearest mud puddle; others again alight like feathers by the water's side, and all are in a twitter of excitement. Watching closely, these curious sons and daughters of Israel at their ingenious trade of making bricks, we may chance to see a circle of them gathered around the margin of the pool, insecurely balanced on their tiny feet, tilting their tails and ducking their heads to pick up little "gobs" of mud. These are rolled round in their mouths till tempered, and made like a quid into globular form, with a curious working of their jaws; then off go the birds, and stick the pellet against the wall, as carefully as ever a sailor, about to spin a yarn, deposited his chew on the mantlepiece. The birds are busy as bees, and a steady stream flows back and forth for several hours a day, with intervals for rest and refreshment, when the Swallows swarm about promiscuously a-fly-catching. In an incredibly short time, the basement of the nest is laid, and the whole form becomes clearly outlined; the mud dries quickly, and there is a standing place. This is soon occupied by one of the pair, probably the female, who now stays at home to welcome her mate with redoubled cries of joy and ecstatic quiverings of the wings, as he brings fresh pellets, which the pair in closest consultation dispose to their entire satisfaction. In three or four days, perhaps, the deed is done; the house is built, and nothing remains but to furnish it. The poultry yard is visited, and laid under contribution of feathers; hay, leaves, rags, paper, string—Swallows are not very particular—may be added; and then the female does the rest of the "furnishing" by her own particular self. Not impossibly, just at this period, a man comes with a pole, and demolishes the whole affair; or the *enfant terrible* of the premises appears and removes the eggs to enrich his sanded tray of like treasures; or a tomcat reaches for his supper. But more probably matters are so propitious that in due season the nest decants a full brood of Swallows—and I wish that nothing more harmful ever came out of the bottle. [The Swallow's nest was described earlier in this paper as "bottle-nosed" or "retort shaped."] (From *Birds of the Colorado Valley.*)

The "Bibliographical Appendix" to the *Birds of the Colorado Valley* forms the first installment of a proposed "Universal Biography of Ornithology" to which Coues devoted a large part of the

most active years of his life. The greater part of the work remains in manuscript, " greatly to the regret and distinct loss," says Allen, " of ornithologists the world over " (*loc. cit.*). Fortunately that relating to North American ornithology was practically completed up to the time of its publication, 1878-1880. The second installment was published in 1879, and includes the faunal works and papers relating to South and Central America and the West Indies. It contains about 700 titles (*Second Installment of American Ornithological Bibliography, Bull. U. S. Geol. and Geogr. Surv. Terr.*, v, no. 2, 6 September 1879, 239-330).

The third installment, published in the following year, also relates to America, and consists of titles referring to systematic ornithology, or to " publications treating of particular species, genera or families." It is nearly 550 pages in length and completes the Bibliography as far as America is concerned. (*Third Instalment of American Ornithological Bibliography, Bull. U. S. Geol. and Geogr. Surv. Terr.*, v, no. 4, 30 September 1880, 521-1066).

Only one other installment was ever published. It was *Fourth Installment of Ornithological Bibliography: Being a List of Faunal Publications relating to British Birds* (*Proc. U. S. Nat. Museum*, 31 May 1880, 359-482). It consists of " the titles of all publications treating of British birds as such, exclusively, and indiscriminately or collectively."

Coues, in his characteristic rhetoric, had this to say of ornithological bibliography:

> The bibliography of ornithology is a subject which occupied me for several years, in the seventies, and upon which I expended an enormous amount of labor, mainly with my own pen, with comparatively little ostensible result. In 1880, I had published four installments of my intended " Universal Bibliography of Ornithology," these being a few thousand titles relating to the birds of North and South America and Great Britain. In that year my machinery for doing the work broke down, and I found myself amidst the débris of the great plan I had projected or partially accomplished, with many thousand manuscript titles on hand and no prospect of their ever seeing the light. . . . I think I never did anything else in my life which brought me such hearty praise " in mouths of wisest censure "—immediate and almost universal recognition, at home and abroad, from ornithologists who knew that bibliography was a necessary nuisance and a horrible drudgery that no mere drudge could perform. It takes a sort of an inspired idiot to be a good

bibliographer, and his inspiration is as dangerous a gift as the appetite of the gambler or dipsomaniac—it grows with what it feeds upon, and finally possesses its victim like any other invincible vice. Perhaps it is lucky for me that I was forcibly divorced from my bibliographical mania; at any rate, years have cured me of the habit, and I shall never again be spellbound in that way. . . . This raises another question, which may be put in this way: Where is the man who will undertake to bring my North American Bibliography up to date? . . . Among the requisite qualifications may be reckoned more zeal than discretion, youth, health, strength, staying power, unlimited time at command, and access to the foci of ornithological literature in some large eastern city. All my material, both published and unpublished, shall be at the service of any such individual, with such opportunities, and any such appetite for bibliographical immortality; I will even throw my blessing into the bargain. What do I hear in answer to this advertisement: Wanted—A competent bibliographer of North American ornithology? (*The Osprey*, November, 1897, ii, 39-40.)

At the time that Coues was writing this plea, the greatest of American bibliographers, Surgeon John Shaw Billings, U. S. Army, had just completed the First Series of the *Index Catalogue of the Library of the Surgeon General's Office*, the most comprehensive bibliographical work in any science. The field of ornithology was beyond the scope of Billings's great brain-child, otherwise the very work that Coues sought in vain, might have become a reality.

Without lessening his interest in birds, Coues also turned his attention to North American mammals, and in 1877 published a monograph, *Fur Bearing Animals: A Monograph of North American Mustelidæ* (*U. S. Geol. and Geogr. Surv. Terr.*, Hayden, *Miscel. Publ.* No. 8, 1877, pp. i-xiv, 1-348). Later he wrote five monographs on Rodentia to accompany others by Dr. Joel Asaph Allen, later head of the department of birds and mammals of the American Museum of Natural History, New York, the whole forming the ponderous volume four of the Hayden Survey Monographs, as they are known.

Coues's contributions to North American mammalogy, while voluminous, were less important than his ornithological writings, and in a field with which he was far less familar. His work in mammalogy was done between 1868 and 1880, while, therefore, he was yet in active military service. His first papers on mammals appeared in 1867 and were based on his field notes and collections made in

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY OF THE TERRITORIES
F. V. HAYDEN, U. S. GEOLOGIST-IN-CHARGE

MISCELLANEOUS PUBLICATIONS—No. 11

BIRDS OF THE COLORADO VALLEY

A REPOSITORY OF

SCIENTIFIC AND POPULAR INFORMATION

CONCERNING

NORTH AMERICAN ORNITHOLOGY

BY ELLIOTT COUES

Ἠλθ', ἦλθε χελιδὼν καλὰς ὥρας ἄγουσα

PART FIRST
Passeres to Laniidæ
Bibliographical Appendix
Seventy Illustrations

SURGEON GENL'S OFFICE
94338
LIBRARY.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1878

Fig. 12.

Title Page of Coues's Birds of the Colorado.

"This work contains some of the finest bird biographies that have appeared, and was a marked event in the literature of North American ornithology. It added immensely to the reputation of the already well-known and already popular author" —J. A. Allen of the National Academy of Sciences.

Arizona. These papers were: *Notes on a Collection of Mammals from Arizona* (*Proc. Acad. Nat. Sci. Philadelphia*, 1867, 133-136), and *The Quadrupeds of Arizona* (*American Naturalist*, 1867, i, 281-292; 351-363; 393-400; 531-541). These were followed during the next ten years by notes and short articles on different North American species and by a faunal list of the mammals of Fort Macon, North Carolina, *Notes on the Natural History of Fort Macon, N. C. and vicinity* (*Proc. Acad. Nat. Sci. Philadelphia*, 1871, 12-49). During this period 1874-1877, he also published a number of systematic monographs on various genera and families, as well as several anatomical papers (*Antero-Posterior Symmetry, with special reference to the Muscles of the Limbs, Medical Record*, June-September, 1870 in eight installments; *On the Myology of Ornithorhynchus, Comm. Essex Inst.*, 1871, vi, 128-173; *The Osteology and Myology of* Didelphis virginiana, *Mem. Boston Soc. Nat. Hist.*, 1873, ii, 41-154; *Notice of a Cyclopean Pig, Proc. Acad. Nat. Sci. Philadelphia*, 1869, 93-101).

In his *On the Muridæ of the Northern Boundary Survey, with critical revision of the North American Genera and Species* (*Proc. Acad. Nat. Sci. Philadelphia*, 1874, 173-196; reissued with additions as a separate) he described a new "subgenus" (*Vesperimus* — genus *Peromyscus Gloger*, 1841), two new genera (*Ochetodon* — *Reithrodontomys* Giglioli, 1873, and *Evotomys*) and "two new species were here characterized, and are still recognized, although earlier names have since been found for two of the genera." (Allen *loc. cit.*). *Evotomys* is now known to be antedated by *Clethrionomys*, Tilesius, 1850.

There is not space to describe even the more important of Coues's contributions to mammalogy, which include studies of *Mephitinæ*, the jumping mice of North America, *Saccomyidæ* the family *Geomyidæ*, insectivorous mammals, etc.

His contributions to herpetology were written between 1871 and 1878, and include accounts of the reptiles of Fort Macon, North Carolina, and vicinity; the reptiles and batrachians of Arizona; and the serpents of Dakota and Montana.

Coues gave a total of nineteen years of active military service to his country. He enjoyed his medico-military duties even though at

times they were such that he could not devote as much time to ornithology as he wished. He had many temptations to resign and devote himself exclusively to the work of a naturalist, but resisted them. In 1869, his university gave him the degree of Doctor of Philosophy and in the same year he was offered the chair of Zoölogy and Comparative Anatomy at Norwich University, Vermont, but he declined.

The actual dates of his service during and just after the War Between the States are in the records of the Surgeon General of the the Army, National Archives:

March 1864: Assistant Surgeon, U. S. A.
October, 1865—At Fort Whipple, Arizona Territory
To May, 1866—Special duty at the Smithsonian Institution, Washington.
May, 1866—Post Surgeon, Columbia, South Carolina.
1 January 1870—Serving in North Carolina. Ordered to the Department of Virginia.
25 November 1870—Arrived at Fort McHenry, Maryland for duty.
30 April 1872—Relieved and ordered to the Department of Dakota.
19 October 1872—Arrived at Fort Randall, Dakota Territory.
31 March 1873—Relieved and ordered " to proceed without delay to St. Paul, Minnesota, to report to the Commissioners for the Survey of the Northern Boundary, to accompany the expedition as medical officer and naturalist."
15 May 1873—Reported for this duty.
31 October 1873—Reported from the Smithsonian Institution as " elaborating results of the summer's operations in the field."
31 December 1873—Was still at the Smithsonian Institution.
1874—Continued his duties in the field with the Northern Boundary Commission until ordered to New York City to take his examination for promotion.
31 October 1874—Passed his promotion examination, and left for Washington for duty.
31 June 1876—Ordered to " U. S. Geological and Geographical Survey of the Territories under charge of F. V. Hayden, U. S. Geologist."

31 December 1878—Still on this duty. This was his last assignment under the Army.

In 1881 he received an offer that he could not resist. He was offered the position of full-time secretary and naturalist of the Geological and Geographical Survey of the Territories; that it, the present northwestern States. The work was directed by the great geologist, Prof. Ferdinand Vandiveer Hayden, who had been a Surgeon of Volunteers during the War Between the States. Coues accordingly resigned his commission and left the military service. He was but thirty-nine years of age, and before him lay eighteen more years of valuable scientific endeavor. He accepted the chair of anatomy at Columbian (now George Washington) University.

About 1885, Dr. Coues's hitherto incessant intellectual activity in ornithology and mammalogy became diverted into other fields. Even his contributions to *The Auk* were few after 1888 and comprised mostly reviews, short notes on nomenclature, and historical references.

For seven years, 1884 to 1891, his energies and attention were absorbed by work on the *Century Dictionary*, of which he was one of the collaborators. He had charge of the departments of General Zoölogy, Biology, and Comparative Anatomy. For these he furnished some 40,000 definitions and hundreds of illustrations, largely original, drawn under his supervision by E. T. Seton. Of this great work, from an ornithological standpoint, Allen said in his review at time of publication:

"The ornithological matter, both as regards text and cuts, forms a conspicuous feature of the work, which is practically an encyclopedia of ornithology. For those who know Dr. Coues's ability at giving the gist of a bird's history in a few happily worded sentences, it is unnecessary to say that a vast amount of information is compressed into the space of a few lines" (*The Auk*, viii, 222-224).

With others Dr. Coues edited *The Osprey*, an illustrated monthly magazine of ornithology, beginning in 1897. He retired before the completion of one volume under his editorship.

When his work on the *Century Dictionary* was done, Coues turned his attention to a wholly different field. He had long been interested in early explorations west of the Mississippi River and as early as

1876 published *An Account of the various Publications relating to the Travels of Lewis and Clark, with a Commentary on the Zoological Results of their Expedition* (*Bull. U. S. Geol. and Geogr. Surv. Terr.*, February, 1876, no. 3, 7-20). In 1893 there appeared his four octavo volumes *History of the Expedition of Lewis and Clark*, continuously paged, with commentary on the geography, ethnology and natural history of the route.

This work on Lewis and Clark was the beginning of a series of extremely valuable works of this kind. *Expeditions of Zebulon Montgomery Pike*, three octavo volumes, appeared in 1895. In 1897, it was followed by *Journals of Alexander Henry and David Thompson*, for many years (1799-1814) officers of the Northwest Company. This too was a work of three octavo volumes. The *Journal of Major Jacob Fowler*, one octavo volume and the *Personal Narrative of Charles Lapenteur, for forty years a fur trader on the upper Missouri* (two octavo volumes) both were issued in 1898. In 1900 the *Diary of Francisco Garcés*, who traveled through the Indian Territory, Kansas, Colorado, and New Mexico in 1775-1776, was published in two octavo volumes. The revision of the proof sheets of this last was made in part during Coues's last illness.

These works, forming fifteen volumes, consist entirely, except in the case of the expeditions of Lewis and Clark and Pike, of previously unpublished material, and form a mass of new and original information on early explorations in the West, of the highest interest and importance. They are all copiously annotated in reference to the geography, ethnography, and general natural history of the regions traversed by these various explorers, with the usual care and accuracy characteristic of Coues's scientific and bibliographic writings. In order to secure geographical correctness as to localities and the precise routes traversed by several of these explorers, he traveled many thousands of miles over the same routes, these journeys including a personal examination of the route of Lewis and Clark, a canoe trip up the Mississippi to determine Pike's route to the head waters of that river, and an effort to locate the trail of Garces. His admirable equipment for this kind of editorial work is beyond question, and these volumes will ever remain a monument to his industry and intimate knowledge of early conditions in the West, while the information thus made available provides a mine of wealth for future historians. (J. A. Allen, *Nat. Acad. of Sci. Biogr. Memoirs*, 1909, vi, 422-423.)

There was another side of Elliott Coues's nature, one little known

or understood by his scientific associates. He became deeply interested for a time in spiritualism and theosophy. In 1884, while on a visit to Europe, he learned much of theosophy and became an ardent theosophist. On his return, he founded the Gnostic Branch of the Theosophical Society in Washington, and soon became president of the American Board of Control of the Theosophical Society of India and, in 1893, was president of the World's Auxiliary Congress held at Chicago. Despite his other fields of work, he found time to bring out such works as an American edition of Olcott's *Buddhist Catechism*, and edited Robert Dodsley's *True and Complete Economy of Human Life*, adding a subtitle, " Based on the System of Theosophical Ethics." He likewise published various brochures, among which are: *Biogen, a Speculation on the Origin and Nature of Life* (1882); *The Harmony of Scientific Knowledge and Religious Faith* (1882); *The Daemon of Darwin* (1884); *Kuthumi* (1886); *Can Matter Think?* (1886); *A Woman in the Case* (1887); *Neuro-Myology* (1887); and *Signs of the Times* (1888).

He might have become the head of the whole Theosophical movement in America had he not come into conflict with the ambitions of William Juan Judge. His refusal to accept the " Mahatmic messages " brought him the ill will of the Theosophical Society. While in 1888 he wrote of Madame Blavatsky as " the greatest woman of this age, who is born to redeem her times," he published an article in 1889; " Madame Blavatsky's Famous Hoax " and was thereupon expelled from the Society. " To his scientific friends," remarks Peattie, " this was something of an honor." (*loc. cit.*). Even in 1886, he insisted that " Blavatsky " and " Theosophy " were not synonymous terms and that " the manners and morals of any individual theosophist do not necessarily represent the methods, objects, and purposes of the Theosophical Society. (*Science*, 29 January 1886, vii, no. 156, 102).

Like practically all of the Army medical officers who have been ornithologists, Coues was an active member of the American Ornithologists' Union. He was one of the three signers of the call for a meeting of American ornithologists in New York in September, 1883, which resulted in the formation of the Union. He was its first vice-president for ten years, presiding in the absence of the

president at its first meeting, thus having the duty of appointing the six committees established to investigate as many different phases of the subject. He was president from 1893 to 1895, and for many years was chairman of one of the Union's most important committees, that on Nomenclature and Classification of North American Birds. He also played a leading part in preparing the Union's *Code of Nomenclature*, published in 1886.

He was elected to the National Academy of Sciences in 1877 when he was thirty-four years old, being its youngest member. He also held membership in a large number of scientific societies and academies, foreign as well as American.

Doctor Coues was a prolific writer. Allen estimates that in the field of ornithology alone he contributed more than five hundred titles. Besides this, his contributions to North American mammalogy are voluminous, and he wrote extensively in other fields as well. No complete bibliography of his contributions has been compiled, but it is probable that there are not less than a thousand titles from his pen. His most important books and papers on ornithology are listed by Allen in his biography of Coues, numbering 150 items. There are also listed 30 works in mammalogy, three in herpetology, one in general biology, and seven in accounts of early explorations. However, adds Allen, "from this list are omitted hundreds of reviews contributed by Dr. Coues to the *American Naturalist*, *Bulletin of the Nuttall Ornithological Club*, *The Auk*, *Science*, *The Osprey*, the *Nation* of New York, *Field* of Chicago, *Forest and Stream*, *The Oölogist*, and other scientific and literary journals, and also hundreds of short notes and semi-popular articles on natural history subjects, published in other journals and magazines." His many contributions to the literature of spiritualism and the like are also not included in the above estimate.

His capacity for work was enormous—indeed phenomenal if we consider his sedentary habits and disregard of the ordinary precautions of health—and the wonder is that he for so many years maintained a condition of such vigor. In addition to his regular daily literary output, he maintained a voluminous correspondence, writing with his own hand many letters of great length, in a style peculiarly brilliant and spicy—in short, *Couesian*. With all his apparent energy and ceaseless activities, his health at last gave way, and for some years before his death he was a sufferer from a complication of diseases.

During the summer preceding his death he made a journey to New Mexico and Arizona, to refresh his memory of the country described in the diary of Francisco Garcés, which he was editing for publication; this proved too arduous for his reduced powers of endurance, "and he was brought to Santa Fé in a rather critical condition, where for a month he was very ill, but in September came to Chicago." (D. G. Elliot, *The Auk*, 1901, xviii, 9) and later to Washington.

His condition was already critical, and early in December he was taken to the Johns Hopkins Hospital, where he "had to undergo two surgical operations for distinct disorders within a month of each other. He succumbed from exhaustion the second day after the later operation, and died on Christmas day, 1899" [*Osprey*, January, 1900, iv, 80]. Throughout his last illness he maintained courageous spirit, bearing excessive pain without complaint, and wrote occasional letters to his intimate scientific friends up to almost the day of the final operation, expressing doubt as to the outcome; they proved to be his final letters of farewell. (J. A. Allen, *National Academy Biographical Memoirs*, 1909, vi, 424-425.) At the end he is said to have sat up suddenly in bed and cried out: "Welcome, oh, welcome, beloved death." He was buried in the National Cemetery at Arlington, Virginia.

Coues's residence at the time of his death, as for some time theretofore, was at 1726 N Street, Northwest.

Dr. Coues married,* on 3 May 1867, at Columbia, South Carolina, Jane Augusta, daughter of Owen McKenney of Rushford, New York; and later, on 25 October 1887, in Boston, Mrs. Mary Emily Bates, who survived him but died in 1906. Of his five children, all of the 1867 marriage, two died in infancy. The others were: (1) Edith Louise (1868-1939), wife of Nelson O'Shaughnessy of the United States Diplomatic Service; (2) Elliott Baird (1872-), M. D., Bellevue Hospital Medical College, who was also interested in ornithology and became an associate of the American Ornithologists' Union in 1886; and (3) Beverly Drinkard (1878-). The sons resided in Europe. The daughter, Mrs. O'Shaughnessy, inherited her father's ability to write clear and interesting accounts of her experiences. Her best known book is *A Diplomat's Wife in Mexico* (1916), an account of experiences at the time of the Vera Cruz incident. Other books are: *My Lorraine Journal* (1918), *Alsace in Rust and Gold* (1919), *Intimate Pages of Mexican History* (1920),

* Chapter 6 of the first volume of the Statutes of the Territory of Arizona shows a divorce about 1864 of Dr. Coues. This is said to have been an unfortunate early marriage.

Viennese Medley (1924), *Married Life* (1925), *Other Ways and Other Flesh* (1929), and *Maria Adelaide* (1929).

Dr. Coues's half-brother, Samuel Franklin Coues (1825-1916), was commissioned Assistant Surgeon, United States Navy, in 1851, and advancing through the several grades, reached that of Medical Director in 1876. Of Surgeon Coues, Peattie has recently said:

> Coues's personality was . . . influential. His enthusiasm was electrifying, his presence commanding and handsome. True, he was more than a slight eccentric; he was often unpredictable and emotional, but never a bore and seldom unjust. He had several marked aversions; one of them was Buffon as an ornithologist. His associates were endlessly delighted with his humor, which extended (most unusually for an impeccable scientist) to a keen sense of nonsense. Humor and much literary cultivation crop up delightfully and without warning in the soberest of his life histories. (D. C. Peattie, *A Gathering of Birds*, 270.)

He had, said Allen, " with an attractive personality, unusual gifts of expression, which rendered him a ready and effective public speaker, genial and vivacious in conversation, and a writer of marked originality and force. As a reviewer he was kind and considerate; his friendships often assumed the ardor of affection, and the kindness of his nature led him on many occasions to tender a helping hand to younger ornithological aspirants. As an antagonist he was sometimes bitter and unforgiving. An unfortunate illustration of this is his controversy with Dr. T. M. Brewer, of which Dr. Coues himself said, twenty years after the death of his opponent: ' The controversy [in the " Sparrow War "] had become [in 1874] between Dr. Brewer and myself a personal feud, with the usual accompaniments, in the way of sweetness and light ' [*Osprey*, 1897, i, 124]. He detested shams and exposed them ruthlessly. Discovery of truth was the marked incentive of his labors, and he freely and frankly retracted his opinions when convinced that they were wrong. He was naturally conservative, yet was a leader in his special lines of research. He was impulsive and sometimes indiscreet, having some of the failings that usually accompany genius." (J. A. Allen, *National Academy Biographic Memoirs*, 1909).

Coues's own account of what he called " the Sparrow War " is set forth in " Dr. Coues' Column " in *The Osprey* while he was an

editor. Coues's contribution to the "war" was his article: "The Ineligibility of the European House Sparrow in America," *American Naturalist*, August, 1878, 499-505. He made the suggestion that the stomachs of Sparrows be examined to ascertain exactly what these birds eat. The "warriors" on both sides were sufficiently numerous to supply a lengthy bibliography published by Coues in the *Bulletin of the U. S. Geological Survey*, 6 September 1879, 179-196.

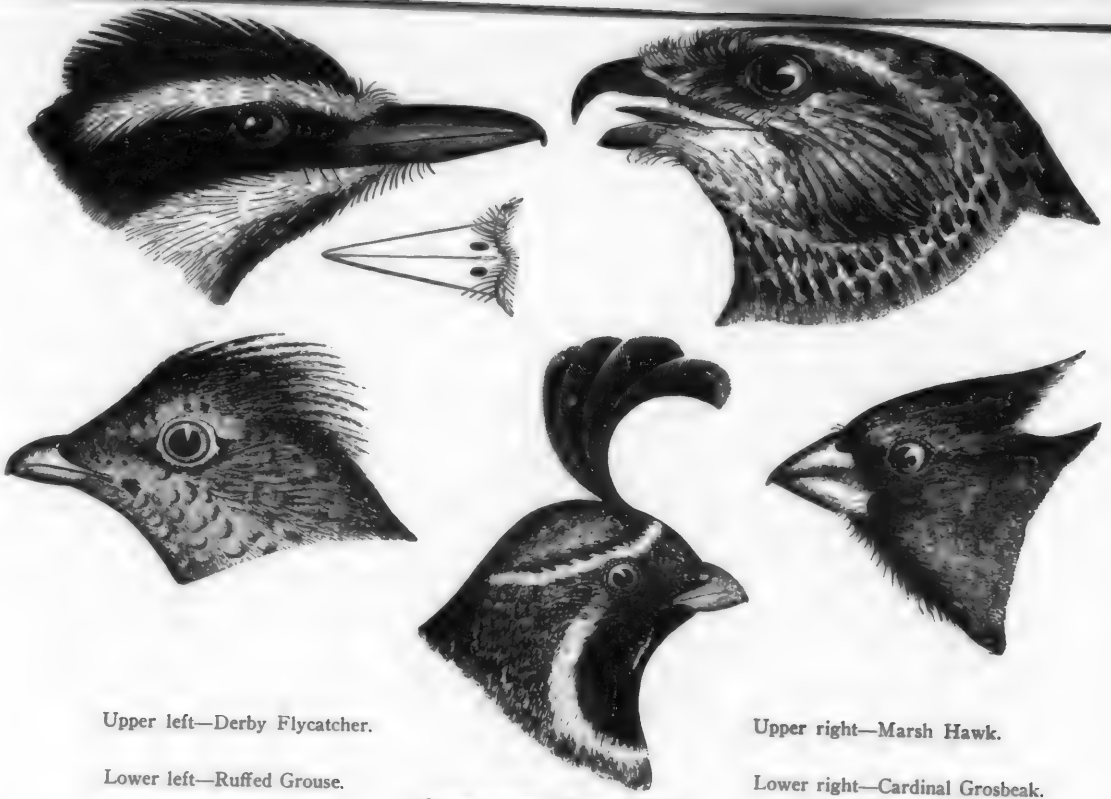
After telling how the Nuttall Ornithological Club decided against Brewer, Coues concludes:

> The most distinguished opponents I ever had were not ornithologists and never pretended to be such. I recollect two of them—Henry Ward Beecher and Henry Bergh. The latter, the founder of the noble Society for the Prevention of Cruelty to Animals, published a tirade against me, in which he called me a "murderer," and all sorts of dreadful things besides. Baird told me he thought it the finest piece of pure invective he ever read. Many years afterwards I met Mr. Bergh for the first time, and became impressed with the same profound respect for his personal character that I had always felt for his humane life-work.
>
> I have sometimes wondered if chagrin at defeat in the Sparrow War did not hasten Dr. Brewer's demise (January 23, 1880). The war practically ended with his death, though it was long before sentimentalists ceased to exhibit hysteria. I naturally lost all active interest in the subject when I had proven my case to the satisfaction of the public, and the Sparrow had proven his case—which was that he had come to stay. . . . (*The Osprey*, May, 1897, i, no, 9, 124.)

> As a naturalist Coues will always hold the highest rank in the estimation of all who are familiar with his works, and in that galaxy of eminent names which sheds so great a brilliancy on the scientific annals of our own land, none shall appear in the years to come more lustrous than that of [Dr. Coues]. (D. G. Elliot, *The Auk*, January, 1901, xviii, no. 1, 11.)

The obituary of Coues, written by Chester Barlow, characterizes him as "one of the ablest and most brilliant scientific writers of the nineteenth century" and continues:

> Few who have followed the writings of Dr. Coues could fail to be impressed with his forceful style, even though they might at times differ from his expressed opinions.
>
> His pen was seldom swayed by the opinions of others, and from it alike could flow the most caustic criticism or the warmest encomium, and he was seldom found without pronounced views on a subject, either favorable or antagonistic. In some of the discussions into which he has entered during



Upper left—Derby Flycatcher.

Upper right—Marsh Hawk.

Lower left—Ruffed Grouse.

Lower center—Helmet Quail.

Lower right—Cardinal Grosbeak.

Fig. 13.

DRAWINGS BY DR. ELLIOTT COUES.
(From the Key to North American Birds, second edition)

All drawings are to scale and in the book are represented in natural size. All are signed "Ad. nat. del. E. C." These drawings are Figures 281, 365, 401, 410 and 254, respectively, in Coues's *Key to North American Birds*, second edition, 1884. Many of the drawings first appeared in his *Avifauna Columbiana*, though in the latter book his initials are not included.

his career, are found examples of his keenest satire and, perhaps, his finest rhetorical effects, and he had been regarded by some as without a peer in this respect. (*The Condor*, Santa Clara, California, January, 1900, ii, no. 1, 23.)

In a later issue of the same journal, there is reproduced what the editor calls "The Last Portrait of Dr. Coues." It is the face of a troubled old man, with white beard and haunting eyes. (*The Condor*, May, 1900, ii, no. 3, 72).

In Recollections of Elliott Coues, his life-long friend, Daniel Giraud Elliot, wrote:

Those who knew Coues, even later in life, must have been impressed by the intensity of the interest exhibited by him when speaking upon some subject that was congenial, and which was a matter of daily thought. How the bright eye grew brighter and more penetrating, the attention fixed and earnest, while the well-phrased sentences fell from his lips with a facile flow that was admirable. This faculty, that was noticeable to everyone who listened to him in his prime, was eminently characteristic of him even in his college days, and his letters at that time were remarkable for the keenness of the reasoning exhibited and the ingenuity of the various arguments employed. Good temper in discussion was an attribute of his youthful days, and the courtesy shown in his intercourse with others in his maturer years was by no means lacking in his youth. Always high-spirited, the consciousness of overability to do seemed to be innate with him; and, both in my correspondence and conversations with him in those early days, I more than once had the impression that he was feeling his way, so to speak, as if not quite certain exactly how far he could trust himself in the line of argument he had for the moment adopted, or was himself seeking its weak points. Always a courteous debater, and equally so in his youth as in his more experienced manhood, he was very attractive in his student days, with his bright face, pleasant manners, love of fun such as appealed to those of his age, but even in his college days or earlier the keen mind was as quick to seize upon a vulnerable place in an argument and turn to profit a point thus gained as in aftertimes when his large experience and ample knowledge made him so formidable an antagonist. And yet, the boy showed no exultation over his victory beyond a bright smile and a clap on one shoulder, with the friendly question, "Am I not right?" or "Is that not so?"

Although Coues gained a prominent position in various branches of natural science, and in literature as well, he was, above all, an ornithologist. From his earliest youth he loved birds and delighted to talk about them and argue the various questions that a discussion of them gave rise to. His mind was always dwelling upon them, and he never lost an opportunity to speak of his favorite subject. I remember once when, arriving in Washington during his student days and seeking him at his residence, I was directed to a certain

hall where a dancing class to which he belonged usually met, and on sending up my name, he came bounding down the stairs two steps at a time with a cheery "Hello, D. G.! Glad to see you!" and almost immediately took up a certain subject on birds that we had had a discussion about in our correspondence a short time before. It was the absorbing passion always foremost in his thoughts. Personally attractive in his mature years, Coues was no less so in his youth, and although our mutual interest in the one common absorbing pursuit of our lives may have brought us more closely together, yet even those who were without the special love of nature's works to afford a breadth of sympathy with him, and who knew him in his youth, could not fail to recognize the traits I, on another occasion, have attributed to him in his boyhood, of being "frank, simple, honest and confiding, with a boy's generous impulses and the glorious enthusiasm of the ornithologist manifest in speech and action." [The paper is illustrated by a photograph of Coues in uniform, at the age of twenty-one, in the author's possession—see Fig. 10.] (*Bird-Lore*, January-February, 1902, iv, no. 1, 3-5.)

The following birds have been named in honor of Coues:

Coues's Shearwater, *Puffinus creatopus* Godman or *Puffinus couesi* Mathews (synonym of *Puffinus opisthomelas*).
Coues's Sandpiper, *Arquetella ptilocnemis couesi* Ridgway
Coues's Northern Cactus-Wren, *Heleodytes brunneicapillus couesi* (Sharpe) .
Coues's Flycatcher, *Myiochanes pertinex pallidiventris* Chapman

(List furnished by Dr. Theodore S. Palmer)

Coues himself described and named the following birds. The list is arranged according to present classification:

Genus of Grebes *Æchmoporus Coues*
Western Grebe, *Æchmoporus clarkii* Coues (synonym of *Æchmophorus occidentalis*)
Gill's Albatross, *Diomedea gilliana* Coues (synonym of Black-browed Albatross, *Diomedea melanophrys*)
Shearwater, *Nectris amaurosoma* Coues (synonym of Sooty Shearwater, *Puffinus griseus*)
Black-vented Shearwater, *Puffinus opisthomelas* Coues.
Pink-footed Shearwater, *Puffinus creatopus* Coues
Genus of Shearwaters, *Zaprium* Coues
Subgenus of Storm Petrels, *Cymochorea* Coues
Ashy Petrel, *Oceanodroma homochroa* (Coues)

Genus of Petrels, *Halocyptena* Coues
Least Petrel, *Halocyptena microsoma* Coues
Genus of Petrels, *Pseudoprion* Coues
Subgenus of Ducks, *Dafilula* Coues
Florida Bob-White, *Colinus virginianus floridanus* (Coues)
Genus of Mountain Plover, *Podasocys* Coues
Kidder's Petrel, *Æstrelata kidderi* Coues
Pribilof Sandpiper, *Arquatella ptilocnemis ptilocnemis* (Coues) (sic)
Baird's Sandpiper, *Pisobia bairdi* (Coues)
Subgenus of Sandpipers, *Delopygia* Coues
Subgenus of Sandpipers, *Heteropygia* Coues
American Herring Gull, *Larus argentatus smithsonianus* Coues
Caspian Tern, *Hydroprogne caspia imperator* (Coues)
Genus of Skuas, *Buphagus* Coues
Cassin's Auklet, *Simorhynchus cassini* Coues (synonym of Whiskered Auklet, *Æthia pygmæa*).
Genus of Pigmy Owls, *Micrathene* Coues
Genus of Elf Owls, *Micropallas* Coues
Florida Nighthawk, *Chordeiles minor chapmani* Coues
Sennett's Nighthawk, *Chordeiles minor sennetti* Coues
Genus of Woodpeckers, *Asyndesmus* Coues
Buff-breasted Flycatcher, *Empidonax fulvifrons pygmæus* Coues
Mitrephorus pallescens Coues (synonym of Buff-breasted Flycatcher, *Empidonax fulvifrons pygmæus*)
Desert Horned Lark, *Otocoris alpestris leucolæma* (Coues)
Genus of Tree Swallows, *Iridoprocne* Coues
Florida Blue Jay, *Cyanocitta cristata florincola* Coues
Subgenus of Jays, *Sieberocitta* Coues
Florida Crow, *Corvus brachyrhynchus pascuus* Coues
Bendire's Thrasher, *Toxostoma bendirei* (Coues)
Least Vireo, *Vireo belli pusillus* Coues
Gray Vireo, *Vireo vicinior* Coues
Plumbeous Vireo, *Vireo solitarius plumbeus* Coues
Sennett's Warbler, *Compsothlypis pitiayumi nigrilora* (Coues)
Cairns's Warbler, *Dendroica cærulescens cairnsi* Coues

Genus of Grosbeaks, *Zamelodia* Coues (synonym of *Hedymeles* Cabanis)

Hoary Redpoll, *Acanthis linaria exilipes* (Coues)

Dusky Redpoll, *Ægiothus fuscescens* Coues (synonym of the Common Redpoll, *Acanthis linaria linaria*)

Greater Redpoll, *Acanthis linaria rostrata* (Coues)

Arizona Goldfinch, *Chrysomitris mexicanus arizonæ* Coues (synonym of Arkansas Goldfinch, *Spinus psaltria psaltria*)

White-eyed Towhee, *Pipilo erythrophthalmus alleni* Coues

Rufous-winged Sparrow, *Aimophila carpalis* (Coues)

Genus of Black-throated Sparrows, *Amphispiza* Coues

Western Chipping Sparrow, *Spizella passerina arizonæ* Coues

California Black-chinned Sparrow, *Spizella atrogularis cana* Coues

Shufeldt's Junco, *Junco hyemalis connectens* Coues (synonym of *Junco oreganus shufeldti*).

(List furnished by Dr. Herbert Friedmann)

PRINCIPAL BIOGRAPHIC SOURCES

1. C. Barlow, *The Condor*, January, 100, no. 1, 23.
2. C. F. Lummis, *The Land of Sunshine*, February, 1900.
3. C. Barlow, The Last Portrait of Dr. Coues, *The Condor*, May, 1900, ii, no. 3, 72.
4. D. G. Elliot, In Memoriam: Elliott Coues, *The Auk*, January, 1901, xviii, no. 1, 1-11.
5. C. A. Curtis, Coues at his First Army Post, *Bird-Lore*, January-February, 1902, iv, no. 1, 5-7.
6. D. G. Elliot, Recollections of Elliott Coues, *Bird-Lore*, January-February, 1902, iv, no. 1, 3-5.
7. E. Coues, Extract from Coues's Journal, *Bird-Lore*, January-February, 1902, iv, no. 1, 8-9.
8. J. A. Allen, Biographical Memoir of Elliott Coues, *National Academy of Sciences Biographies*, Washington, June, 1909, vi, 397-446.
9. H. A. Kelly, Kelly and Burrage's *American Medical Biographies*, 1920, 253-254.
10. H. C. Yarrow, Personal Recollections of Old Medical Officers: Major Elliott Coues, *The Military Surgeon*, Washington, May, 1927, ix, no. 5, 588-589.
11. National Cyclopedia of American Biography, v, 240-241.

12. W. Stone, *Dictionary of American Biography*, 1937, iv, 465-466.
13. D. C. Peattie, *A Gathering of Birds*; an Anthology of the best ornithological prose, with biographical sketches, New York, Dodd, Mead & Co., 1939, pp. 379, 269 *et seq.*
14. T. S. Palmer, Notes on Persons whose Names Appear in the Nomenclature of California Birds, *The Condor*, September, 1928, xxx, no. 5, 275.
15. R. M. Strong, A Bibliography of Birds, Chicago, 1939, i, 238-239 (titles of twenty-nine of Coues's ornithological publications).
16. T. H. S. Amersly, Complete Register of the Army, 1779-1879, 376.
17. G. V. Henry, Military Records of Civilian Appointments in the U. S. Army, 66.
18. MS records of the Surgeon General of the Army, National Archives.

(*To be Continued*)

SOME UNPUBLISHED LETTERS OF FLORENCE NIGHTINGALE

COLONEL HAROLD WELLINGTON JONES, M.C., U. S. Army
Librarian, Army Medical Library

Florence Nightingale is an immortal. Perhaps there never lived a woman who so appealed to the emotions of countless millions, during her lifetime. Many biographies of the Lady with the Lamp have been published since the beginning of the present century, and it may be presumed that most of the details of her life have already appeared in print. A few weeks ago, however, four of her early letters came into our possession and as far as can be ascertained none has been published. One of them is exceptionally long. It was penned when she was 24 years of age, years before her monumental task had taken form. The letter is full of the restless musings of a young woman who realized even then, the apparent uselessness of her kind in dealing with the problems of the outside world and especially those of the Victorian world.

The other letters, written in the Crimea, call up the shades of Scutari, Balaclava, Alma, Inkerman and Sebastopol, and they serve to remind us that Florence Nightingale was never too busy to share the sorrows of the bereaved nor to give advice and counsel whenever the need arose. The flimsy envelopes, the early postmarks, the tiny seals attached with her own hands all carried one's thoughts back over the years to a long closed chapter of British history and to the beginning of a new era in the care of the sick and wounded in war. The letters are presented in full and in chronological order with occasional notes to explain references to historical events and persons.

The Letters

The earliest written from Embley has an envelope bearing a postmark of February 5, 1845, the letter itself being undated and this fact is explained by the writer in the last paragraph. The envelope is stamped with the head of Queen Victoria and a wafer appears on

the back. It is addressed to Miss Otter,[1] Edward Strutt's M. P. St. Helen's, Derby.[2]

My dear Maria:

The prisoner at the bar was asked whether she had anything to say for herself, but she could only recommend herself to mercy. I completely acknowledge my sins, but I do not mean to reform just yet. Now, however, that conscience in my absence has taken up the pen, it occurs to her that she has nothing to say. The thought comes too late however. She never sees her faults till after she has made them, which is certainly the way to see them, but not for your advantage nor for mine. You see I am writing sentiments on fancy dress at home, but whether in the character of Ecclesiastes the Preacher, or of my recollections as a chaperon, I am not quite clear. The reason of this is that all my young people are at Waverly, bless their merry hearts! I have been there this last month. I have had two fancy balls. I could not go. Well, well. "The mind is its own gown, and fancy dress can make of flannel shirt or flannel skirt of fancy dress—and as Rosalind says, Tis but one cast away & so come death. At all events, if Milton wrote his Morning Hymn in Paradise by the light of long sixes, I can as well write an account of my lost garden of Eden, (of Waverley, I mean,) by the side of my little black tea-pot on the hob. Marianne[3] as Mary Q. of Scots and Parthe[4] as Ly. Jane Grey, I hear were "quite the thing." When I think upon my pink gown—there stirs even within my old breast still the pride of life, which St. John says he had, and of black lace flounces which he doesn't, but which he would have had, if he had seen mine—but otherwise nobody even will be so old as I am,

[1] Maria Otter was the sister of Mrs. Strutt and the daughter of William Otter, Bishop of Chichester, a noted divine. She afterward became the wife of Sir William James. Another sister married Henry Malthus the son of the author of the famous doctrine bearing his name. Still another sister married the first Lord Romilly. Maria Otter's daughter who later became the custodian of the letter was the late Mrs. G. Solis Schwabe, the wife of a well known officer of the Indian Army.

[2] Edward Strutt, F. R. S. was the first Baron Belper of St. Helen's House, Derby, and the son of a noted scientist of the same name. He himself was distinguished for his attainments in science and economics, and he was an intimate of Jeremy Bentham and John Stuart Mill. He was M. P. from 1840-47 and again from 1851 until his elevation to the peerage five years later. Edward Strutt was a recognized authority on free trade, law reform and education, and was an intimate and respected friend of his contemporaries, among whom were Macaulay, Romilly, McCulloch and Charles Buller. He married Amelia Harriet Otter in 1837.

[3] Marianne was Florence's cousin, the daughter of Mrs. Nicholson, Mrs. Nightingale's sister. She later married Sir Douglas Galton.

[4] "Parthe" was Florence's elder sister afterward Lady Verney. She was born in Naples and was named Frances for her mother. Her middle name, Parthenope, was given her after the old Greek settlement on the site of her birthplace.

don't expect it, for you never will. And I shed a few tears on the fashion of this world which passes away, as you will think on some sentiments not quite so well defined, of the fashion of fancy flounces which passes away as quickly. I expect my young people back with Miss Johnson,[5] whose reputation may perhaps have reached your ears, as Guide & Counsel in Ordinary & Legal Adviser in Education to our family to the tenth generation. I expect them back, with her to keep them in order, some time in the course of the year. My youngest hope, W. E. Nightingale,[6] has returned to me, but leaves me to morrow for Derbyshire. The immediate cause however for my trembling hand's again assuming the pen, is to ask after Mrs. Romilly,[7] whose confinement I saw in the paper about 40 days after date, during which time I rejoice to think she has *not* been making Lent in consequence of my not knowing of the event. And now, beloved, do I speak to a lady of *ton* and fashion,? immersed in new Polkas & the Derby dancing circles, or shall you and I sit down & we two will rail at our mistress the world & all our misery? If *you* will, *I* will, but I know you never rail, so no more will I, and instead of that, I will tell you about our mistress the Queen at Strathfieldsaye, which was a most entire failure. The only people of *her* society asked were the Ashburtons,[8] it was the most unaccountable thing his not asking the Palmerstons,[9] quite like a personal offence, but they say the old Duke [10] cares now for nothing but flattery and asks nobody but masters of hounds. On this occasion the Duchess was deadly, *regnova il terror nella città*! Not a sound was heard, not a funeral note, as the queen's corse was carried in to dinner, and in the evening it was still worse, everybody stood at ease about the drawing room, and demeaned themselves like soldiers on parade. The queen did her very best and died like a hero, but she was overpowered by numbers, gagged and her hands tied. The only amusement of the evening was seeing Albert taught to miss at billiards, but not a man, who disturbed the silence deep of the grave where our queen we were burying.

My dear, if I did know where this would find you, I would tell you some very very curious and valuable state secrets about the discoveries of the Opening-of-Letters Committee, reaching back as far as Car. Wolsey, to me communi-

---

[5] Probably a Governess. I can find no mention of her in any biography.

[6] Her father.

[7] Maria Otter's older sister. See Note 1.

[8] In 1842 Lord Ashburton had negotiated the treaty bearing his name between the U. S. and Great Britain. His wife was an American.

[9] Lord Palmerston had been foreign minister, but at the time the letter was written he was out of office. Ten years later he became prime minister at the age of 70.

[10] Undoubtedly the 4th Duke of Newcastle whose seat was in the adjoining county of Nottinghamshire, at Strathfieldsaye. The Duke was at that time about 60 years of age.

cated by one of the Com^es, but as it may find you in the house of Edw. Strutt, Esq. M. P. I think it more prudent not. Helen Richardson,[11] I am happy to inform you, was at the Waverley ball. An' you love me, my friend, do tell me what are we to do on the Martineau [12] faith,—I have fought the case straight through upon Paley's evidence, against all her enemies, but I have just had a communication which beats all faith. Oh Jane, Jane,[13] would that thou wert at the ultimissima Thule. Perhaps, beloved, the magnanimity of your disposition, deriving strength from the circumstance, that my conduct towards you is what lambs could not forgive nor worms forget, now prompts you to enquire after my precious health. All extraordinary particulars, not furnished you by the public prints, about the last (not Annus, but) *Mentis Mirabilis* of my life I am ready to give you, and are as follows—I have gone to bed early, and got up late, eaten my 6 meals a day regular (and reduced the amount of intellectual food supposed to be required by a reasonable creature to a magnitude, less than the least assignable quantity, that is, the quantity assigned by Solomon's mother to a virtuous woman. Ah, ***mein kind***, I wish it was, ***quo stupidior es melior*** I should be in a fair way then,—but as it is, don't you often feel as if you were in a dream. I am sure I did, the night of the Waverly ball. It was such a night, the night of the full moon. I have not seen such an one since the moon-light on the hills of Florence—and the lighted town shone in its hushed brightness like a child asleep and there was no life stirring but I and three hares, who were running after one another all night, and at the same time, I could see myself in the dining room at Waverley, and was not quite sure, do you know, which was which. What *is* time and distance? It is so curious, what *is* the effect they have upon us, it is so difficult to find out, which is the real life and which the imaginary. Perhaps I really was not there. My dear, you will think I am Mrs. Fleming,[14] but I am still your industrious Flea. How much that old moon must have seen in her day and what a waste of opportunity it is for her not to publish her Recollections. Reminiscences of a Full Moon would write so well. But how tired she must be of all the confidences that have been made to her and how long she must think it since man has lived and thought and felt, and always the old bores, the same things, in spite of all the different revolutions and religions and civilizations in the world. I never see a full moon without thinking what she looked down upon [15] 1813 years ago, and all the sufferings and thoughts and feelings she has seen since, which no one else has seen.

---

[11] There is no record to be found of her.

[12] In later years Florence Nightingale carried on an active correspondence with Harriet Martineau who became one of her ablest champions.

[13] Jane was Mrs. Strutt's first name. Maria had no middle name. The reference is not clear.

[14] No reference to Mrs. Fleming can be found.

[15] The Crucifixion.

How amazed she must be to see all the souls pouring out and theorizing up to her (and their bodies sitting somewhere quite quietly) all meeting there together unconscious of one another's presence, and a whole division of them telling her the same thing, *unknownst* to one another, each as if nobody had ever felt it before. I could not help laughing to think of the strange tale she must have to tell that single star that's at her side. Well, my dear, don't shoot me. I'm coming down.[16] These reflections were suggested to me by the 2d question I have to ask you which is, We have a night cap of yours which I will either send you by the post, *free of expense* or bring up to town with my own jewellery, when we come, *which* you please. Perhaps you are already in that dear native village of ours, gone to open Parliament. If so, pray give my love to Mrs. Strutt and all who may remember me, though that now belongs to the Geology of the Primary State. My internal structure is nearly defunct, and therefore my 3rd question is can you send me any considerations on Lady Jocelyn,[17] *envisagée sous le point de vue* of Mental Philosophy. I have lately had an opportunity of studying that phenomenon during a visit at Broadlands, and you and I must work out that question together. As she sat and worked and worked and worked, and did not speak, she always reminded me of a saint. She does not interest herself for anything that all the world is pursuing after and always seems enough for herself. I could see a white lily in her hand and a St. Bertha crown upon her passionless forehead. And yet I suppose no one ever lived 4 and 20 years of such excitement—half the young peerage has proposed to her—and it is *not* that now she has other interests. She never spoke to Ld. Palmerston, and tho' she is very fond of her baby, she told me herself she did not care to play with it—her manner is just the same to Ld. Jocelyn and to the shoe-maker. What is the secret of this woman's content? She is so unlike this restless and uneasy generation. She is more like the idyllic ladies, or like Helena Walling[18] in the contemplation of her own beauty. What a lovely creature she is—or—(My dear, forgive me the profanity, but sometimes I fancied she was thinking of her confinement, which she is within a few days of),[19] like the Behold! the handmaid of the Lord. One could almost call it great, this sublime placidity of hers, if greatness is, to be one with one's self, without change, without restlessness, after the life she has had. Monotonous as she is, I never saw any one

[16] Possibly a reference to Davy Crockett and the coon.

[17] The wife of Robert, viscount Jocelyn (1816-54), son of the 3rd Earl of Roden. He never inherited his father's title. The baby mentioned in the letter was her daughter Alice-Maria. Lady Jocelyn was Frances Cowper, the daughter of the 5th Earl Cowper, and a great belle in her day.

[18] No reference to her can be found.

[19] The second child like the first was a daughter. Her third child, born the following year, became the 4th Earl of Roden in 1870 on the death of his grandfather.

who more excited my curiosity to know her secret. Perhaps you will say it is want of earnestness, but bless my heart! if earnestness breaks one's heart, who is fulfilling best the Creation's end, one who is breaking her heart or this woman "of herself is King," who has kept her serenity in the midst of excitement and her simplicity in the midst of admiration? The *signoria di me* is such a blessing. It might have been one of the Beatitudes, Blessed is the man, who is a king complete within himself and he need have added no other blessing. On second thoughts however, my dear, I incline to think that our Saviour probably knew best and I was right after all in not substituting strong in heart for poor in spirit. So I shall let it stand. Weakness is perhaps a greater blessing than strength, and all one's uncertainties to kill out one's intense interest about the events which are to occupy one's dear life. Are you asleep my love or in the Mesmeric state (according to H. M.),[20] the most intelligent of all states, in which I ask, are you asleep? You can answer in capital letters Y. E. S. Horror seizes me at what I have done, but conscience. when it takes up the pen, is always prosy, you know, and I hereby faithfully promise never again to write more than 3 lines, and I will take care to count them. Do you know Lady Ashburton?[21] She is at this moment the lady of my affections. I allow the diamond raspberry tart on her forehead is not inviting but I have a weakness for Americans and I had so much curious information to give *her* upon that country and its inhabitants! When we come upon Mesmerism and from Mesmerism to Vestiges[22] and we had just got up so high into the "law of Development in Organic Nature" that I could not get down again to say good night, but was obliged to go off as an angel. Oh do not put me down as one of the contrary species. *A Dieu*, my beloved, I hope you will not say *Au Diable*, if you do I deserve it, but am still your contrite, affectionate, repentant—more now for having written than for not-overflowing. F. N.

Embley xxxx Dates are always better avoided but we will suppose that it is a week since I saw your dear face.

The second letter is in an envelope postmarked Nov. 12, 55 and is addressed to Mrs. Rotch, Sunbiton, Ilingston on Thames.[23]

[20] Harriet Martineau.

[21] See Note 8.

[22] Vestiges of Creation by Robert Chambers (1844).

[23] Here is an example of the personal painstaking care so characteristic of Florence Nightingale in answering the many appeals she received. At the time, Sebastopol had fallen but six weeks and the British cemeteries and hospitals were full. Miss Nightingale had left Scutari for Balaclava but 15 days before and she remained in the Crimea for still another month, leaving for Scutari on the outbreak of cholera there early in the winter. Although her original instructions made her only Superintendent of the Female Nursing Establishment, by this time she had actually become Purveyor to the Hospitals by the necessities of the situation.

Castle Hospital
Balaclava,
Oct.br. 25th, 55.

My dear Madam:

Your letter was forwarded to me at this place where my hospital duties at present require me. I have desired that enquiry should be made of Dr. Blackwood [24] concerning his attendance on your son; he remembers perfectly well, having called in to him in the middle of the night, but when he reached him, he was quite unconscious. He remembers, however, hearing that he had been seen previously, earnestly in prayer. He also recollects hearing how much he was valued and beloved.

I fear that it is impossible now to recover any of the articles which were sold as I have already made enquiries of the Purveyor to that effect.

I will open the Bale you speak of upon my return to Scutari and let you know its contents.

I trust that we shall not have the sufferings to deplore this winter which we all witnessed last year. I beg to remain, dear Madam, with true sympathy for your great loss,

Yours faithfully,

FLORENCE NIGHTINGALE.

Scutari,
Barrack Hospl
Jan 18/56

Madame.

In reply to your letter of Jan 4 I am very happy to be able to inform you that

Edward Austen
2nd Drag. Gds.
(Scotch Greys)

went home to England Dec. 11/55. I therefore return to you his wife's letters and trust that ere this her heart is lightened of its troubles.

I remain

Your obedt. servt.

FLORENCE NIGHTINGALE.

[24] The Rev. Dr. Blackwood. He was a volunteer military chaplain in the Crimean War.

General Hospital
Balaclava,
April 25/56

My dear Miss Tibbutt.

In reply to yours of 19 April as I am not in *immediate* want of Taintor & Wilsdon up here, I would undoubtedly think it better for you that you should wait till you hear whether Mr. & Mrs. Paget will come for you or not as there is no good to be gained by your coming up here excepting amusement (and very little of what without Mr. and Mrs. Paget) and you do not wish to go home till you are no farther needed for the work and as you feel that you have never taken such a journey without some one to take care of you.

I hope the singing will fall through. But I should be very sorry to make any change in your arrangements as it would excite attention. I am very glad you refused that the nurses should lead the singing.

I have no more faith in Howell than I have in Dawson and should think it hardly right to have Cator up without a positive necessity leaving Howell in her place, especially without yourself.

As we send down 3 ships full of sick to Scutari next week, so I hear from Headquarters, I should be afraid of dismantling Scutari hastily.

Believe me
ever yours
F. NIGHTINGALE.

The fourth letter is among the last written by Florence Nightingale from the Crimea. She sailed for England two months later arriving in London August 5, 1856. As a friend said, "She had done a great deed . . . she had shown the way to a new and high calling for women."

BIBLIOGRAPHY

Andrews, Mary Raymond S. A Lost Commander, Florence Nightingale. N. Y., 1929.

Burke, Bernard (Sir). Dictionary of the Peerage, 18th ed. Lond., 1856.

Cook, Edward (Sir). The Life of Florence Nightingale (2 vols.). Lond., 1913.

Lee (Sidney) and Stephen (Leslie). Dictionary of National Biography. 63 vols., Lond., 1885-1900.

Tooley, Sarah A. The Life of Florence Nightingale. London, 1904.

PURKINJE'S ORIGINAL DESCRIPTION OF THE PEAR-SHAPED CELLS IN THE CEREBELLUM

HENRY R. VIETS, M. D.
AND
F. H. GARRISON, M. D.*

The large ganglion cells, which form such a distinct layer in the cerebellum of the brain, are usually referred to as Purkinje cells. The exact description of these cells by Purkinje and the location of the paper in which he described them is not easily found in the medical literature. Some twenty years or so ago, however, the late Dr. F. H. Garrison assisted me in making a search for the original description by Purkinje. The paper was published in an obscure and now somewhat rare journal, the *Bericht über die Versammlung deutscher Naturforscher und Aerzte*, Prague, 1838, volume 15, pp. 174-175, 178-180. The meeting of the Society, at which Purkinje read the paper, was held in Prague, September 1837. The journal, incidentally, was published each year, with various titles and at various places. The September meeting for 1836, for instance, was held in Jena; the volume of transactions was published in Weimar in 1837, with the title, *Amtlicher Bericht über die Versammlung deutscher Naturforscher und Aerzte.*

Purkinje's article itself describes various cells and structures of the nervous system and is illustrated by a plate, labelled " Purkinje's mikrosc. Untersuchungen II " (opposite p. 174). The pear-shaped cells of the cerebellum are Figure 18 of this plate. (See figure). In addition, however, a drawing of a single Purkinje cell, somewhat enlarged, just above the group of cells, is not shown in the figure reproduced here. The description of these cells is as follows:

> " Im hintern Lappen des grossen Gehirns in der Nähe der gelben Substanz innerhalb der Marksubstanz findet man gleichfalls gangliöse, längliche, feigenförmige Körperchen mit Fortsätzen an dem dünnen Ende. Aehnliche Körperchen in grosser Anzahl und reihenweis die gelbe Substanz umgebend, zeigen

* Died, April 19, 1935.

sich allenthalben in den Blättern des kleinen Gehirns. Jedes dieser Körperchen ist mit dem stumpfen, rundlichen Ende nach innen gegen die gelbe Substanz gekehrt, und zeigt in seinem Kolben deutlich sammt seinem Hofe den centralen Kern; das andere schwanzförmige Ende ist nach Aussen gerichtet, und verliert sich mit meist zweien Fortsätzen in der grauen Substanz bis nahe an die äussere Peripherie, wo diese mit der Gefässhaut umsponnen ist." (p. 180).

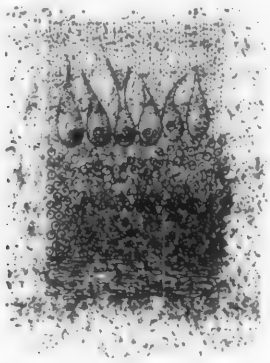


Fig. 18 from Purkinje's Original Plate.

Bericht über die Versammlung deutscher Naturforscher und Aerzte. Prag, 1838, Vol. 15, p. 174.

MEDICO-HISTORICAL NEWS AND ACTIVITIES

American Association of the History of Medicine

The *Fall Meeting* of the Association was held in Cleveland, Ohio on October 7, 1940 under the auspices of the *Ohio Committee on Medical History and Archives* under the chairmanship of Dr. Howard Dittrick. It was very well attended and all participants were unanimous in declaring it a great success. A report will be published in one of the next numbers of the Bulletin.

The *Seventeenth Annual Meeting* will be held in Atlantic City on May 4-6, 1941. The following general program is being considered:

Sunday, May 4, 3 p. m.: Meeting of the Council.

Monday, May 5, 10 a. m.: Six papers (20 minutes each)

2 p. m.: 1. Business Session.
2. The Fielding H. Garrison Lecture, delivered by George Sarton.
To commemorate the 400th anniversary of the death of Paracelsus:
3. Symposium on Paracelsus.
4. Demonstration of a Paracelsus Exhibit.

8 p. m.: Dinner Session with two papers.

Tuesday, May 6, 10 a. m.: Six papers of 20 minutes each.

Members intending to present a paper are requested to announce it *as soon as possible* to the president Dr. Esmond R. Long, Henry Phipps Institute, 7th and Lombard Sts., Philadelphia, Pa. and to indicate at the same time whether they could read the paper on either day or only on Monday. Papers for the Paracelsus Symposium will be by invitation.

The Association regrets to announce the death of its honorary member Dr. Maude Abbott in Montreal, and of its active member C. N. B. Camac, in Altadena, Calif. Obituaries will be presented at the next annual meeting.

Constituent Societies

The *New York Society for Medical History* announces a very interesting series of lectures for the season 1940-1941:

Medicine and Social Change

1. October 3rd	Theories of Disease: A Socio-Historical Review
2. November 7th	Physician and Patient in History
3. December 5th	The Rise of Modern Medical Institutions
4. January 2nd	Social Factors in the Rise of Public Health
5. February 6th	Social and Historical Aspects of Chronic Illness
6. March 6th	Social Aspects of the History of Mental Disease
7. April 3rd	Changes in Public Attitudes towards Medicine: Historical Aspects
8. May 1st	Historical Inter-relationships of Medicine and Social Welfare

The lectures will be held in Squibb Hall, 745 Fifth Avenue, New York at eight-thirty o'clock sharp.

The *Johns Hopkins Medical History Club* was founded on November 10, 1890 in the Library of the Johns Hopkins Hospital by William Osler, William H. Welch, Howard A. Kelly and a group of 30 Hopkins physicians. For 50 years the Club met in the Hospital or in the homes of members and more recently in the Institute of the History of Medicine. It stimulated a great deal of interest in the history of medicine and produced a large number of valuable studies, many of which were published in the Johns Hopkins Hospital Bulletin.

The Club, which in all probability is the oldest still existing medical history society in the world, will commemorate its fiftieth anniversary on November 18, 1940. A dinner will be held in the William H. Welch Medical Library and will be followed by a meeting at which Dr. Howard A. Kelly and Dr. W. G. MacCallum will be the principal speakers.

National News

University of Pennsylvania

The *Bicentennial Conference* held in Philadelphia on September 16-20, 1940 included a Round Table on the history of science that was very well attended. The papers will all be published by the University of Pennsylvania Press. The program was:

Monday, Sept. 16

Chairman: *George Sarton*

Ancient Mesopotamia and the Beginnings of Science
Ephraim Avigdor Speiser

Some Fundamental Concepts in Ancient Astronomy
Otto Eduard Neugebauer

An Application of Modern Logic to a Problem of Natural Science
Edgar Arthur Singer

Tuesday, Sept. 17

Chairman: *Francis Randolph Packard*

Medicine and Surgery in Ancient Egypt
Hermann Ranke

Mediaeval Medicine
Henry Ernest Sigerist

The Rise of Modern Scientific Medicine
Richard Harrison Shryock

Yale University

Our honorary member *Dr. Arturo Castiglioni* has been appointed Research Associate with the rank of Associate Professor. He has announced a seminar:

The Dawn of Anatomical Teaching

The Influence of the Great Artists and Printers of the Renaissance on the Evolution of Anatomy. The Anatomical Theater as the First Center of Practical Experimental Scientific Research.

The seminar began on October 2 and is held on Wednesdays at 4.30 p. m. in the Library of Physiology, B 105, Sterling Hall of Medicine.

University of Wisconsin

Professor *Lancelot Hogben,* of the University of Aberdeen, author of "Mathematics for the Millions," has become for the present academic year a member of the faculty of the University of Wisconsin. He is giving a course on the history and significance of science, and is conducting a seminar in genetics.

Beaumont House on Fort Mackinac Island

Plans are being made to reconstruct the house below the Fort on Mackinac Island where Alexis St. Martin was shot, and to make it a Beaumont Museum.

Camden, N. J.

Dr. Hyman I. Goldstein has been appointed Editor in charge of the Section on Historical Gastroenterology of The Review of Gastroenterology.

Chicago, Ill.

The *Society of Medical History of Chicago,* Ernest E. Irons, President, is holding a meeting in the Assembly Room of the Institute of Medicine of Chicago, 4th floor of the Crerar Building, 86 East Randolph Street, on Monday evening, November 4, 1940, at 8 o'clock. The following illustrated addresses will be given:

Medical Medallions (exhibit): Abraham Levinson
Wollaston and Hemianopsia: James E. Lebensohn
Bretonneau, Trousseau, and Velpeau: Jerome Head